NWA570N

Wireless N Access Point/Bridge

User's Guide

Version 1.00
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Edition 1

DEFAULT LOGIN	
IP Address	**http://192.168.1.2**
Password	**1234**

ZyXEL

www.zyxel.com

About This User's Guide

Intended Audience

This manual is intended for people who want to configure the ZyXEL Device using the web configurator. You should have at least a basic knowledge of TCP/IP networking concepts and topology.

Related Documentation

- Quick Start Guide
  The Quick Start Guide is designed to help you get up and running right away. It contains information on setting up your network and configuring for Internet access.
- Web Configurator Online Help
  Embedded web help for descriptions of individual screens and supplementary information.

It is recommended you use the web configurator to configure the ZyXEL Device.

- Supporting Disk
  Refer to the included CD for support documents.
- ZyXEL Web Site
  Please refer to www.zyxel.com for additional support documentation and product certifications.

User Guide Feedback

Help us help you. Send all User Guide-related comments, questions or suggestions for improvement to the following address, or use e-mail instead. Thank you!

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Document Conventions

Warnings and Notes

These are how warnings and notes are shown in this User's Guide.

Warnings tell you about things that could harm you or your device.

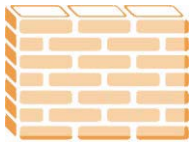
Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

Syntax Conventions

- The NWA570N may be referred to as the "ZyXEL Device", the "device", the "system" or the "product" in this User's Guide.
- Product labels, screen names, field labels and field choices are all in **bold** font.
- A key stroke is denoted by square brackets and uppercase text, for example, [ENTER] means the "enter" or "return" key on your keyboard.
- "Enter" means for you to type one or more characters and then press the [ENTER] key. "Select" or "choose" means for you to use one of the predefined choices.
- A right angle bracket (>) within a screen name denotes a mouse click. For example, **Maintenance > Log > Log Setting** means you first click **Maintenance** in the navigation panel, then the **Log** sub menu and finally the **Log Setting** tab to get to that screen.
- Units of measurement may denote the "metric" value or the "scientific" value. For example, "k" for kilo may denote "1000" or "1024", "M" for mega may denote "1000000" or "1048576" and so on.

Icons Used in Figures

Figures in this User's Guide may use the following generic icons. The ZyXEL Device icon is not an exact representation of your device.

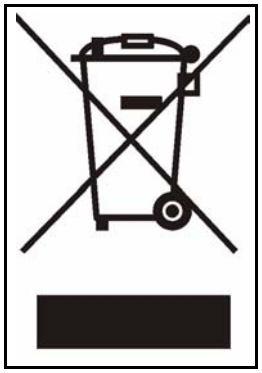
ZyXEL Device	Computer	Notebook computer
Server	DSLAM	Firewall 
Telephone	Switch	Router

Safety Warnings

For your safety, be sure to read and follow all warning notices and instructions.

- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Do NOT expose your device to dampness, dust or corrosive liquids.
- Do NOT store things on the device.
- Do NOT install, use, or service this device during a thunderstorm. There is a remote risk of electric shock from lightning.
- Connect ONLY suitable accessories to the device.
- Do NOT open the device or unit. Opening or removing covers can expose you to dangerous high voltage points or other risks. ONLY qualified service personnel should service or disassemble this device. Please contact your vendor for further information.
- Make sure to connect the cables to the correct ports.
- Place connecting cables carefully so that no one will step on them or stumble over them.
- Always disconnect all cables from this device before servicing or disassembling.
- Use ONLY an appropriate power adaptor or cord for your device. Connect it to the right supply voltage (for example, 110V AC in North America or 230V AC in Europe).
- Do NOT allow anything to rest on the power adaptor or cord and do NOT place the product where anyone can walk on the power adaptor or cord.
- Do NOT use the device if the power adaptor or cord is damaged as it might cause electrocution.
- If the power adaptor or cord is damaged, remove it from the device and the power source.
- Do NOT attempt to repair the power adaptor or cord. Contact your local vendor to order a new one.
- Do not use the device outside, and make sure all the connections are indoors. There is a remote risk of electric shock from lightning.
- Do NOT obstruct the device ventilation slots, as insufficient airflow may harm your device.
- Antenna Warning! This device meets ETSI and FCC certification requirements when using the included antenna(s). Only use the included antenna(s).
- If you wall mount your device, make sure that no electrical lines, gas or water pipes will be damaged.

This product is recyclable. Dispose of it properly.



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PART I
Introduction and Wizards

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1

Introducing the ZyXEL Device

This chapter introduces the main applications and features of the ZyXEL Device. It also introduces the ways you can manage the ZyXEL Device.

1.1 Overview

The ZyXEL Device is a 4-in-1 Access Point with IEEE 802.11n draft 2.0 wireless technology. Access Point (AP), repeater, bridge and wireless client functions allow you to use the ZyXEL Device in various network deployments.

The ZyXEL Device Access Point (AP) allows wireless stations to communicate and/or access a wired network. It can work as a bridge and repeater to extend your wireless network. You can also use it as a wireless client to access a wired network through another AP. The ZyXEL Device uses IEEE 802.1x, WEP data encryption, WPA (Wi-Fi Protected Access), WPA2 and MAC address filtering to give mobile users highly secured wireless connectivity. IEEE 802.11b, IEEE 802.11g and IEEE 802.11n draft 2.0 compliant wireless devices can associate with the ZyXEL Device.

The ZyXEL Device is also Wi-Fi Protected Setup (WPS) enabled, allowing you to quickly add other WPS enabled devices to your wireless network at the touch of a button or the entry of a PIN.

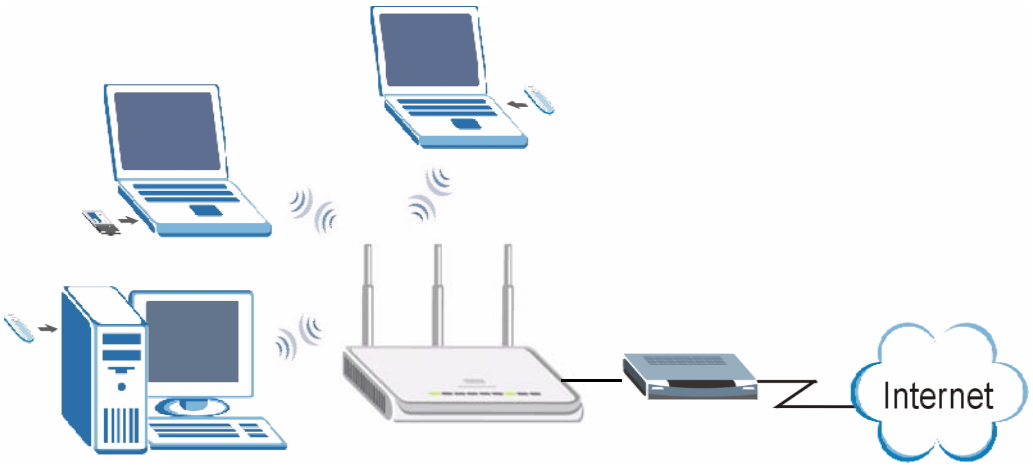
1.2 Applications for the ZyXEL Device

Here are some application examples of how you can use your ZyXEL Device.

1.2.1 Access Point for Internet Access

The ZyXEL Device is an ideal access solution for wireless Internet connection. A typical Internet access application for your ZyXEL Device is shown as follows.

Figure 1 Internet Access Application

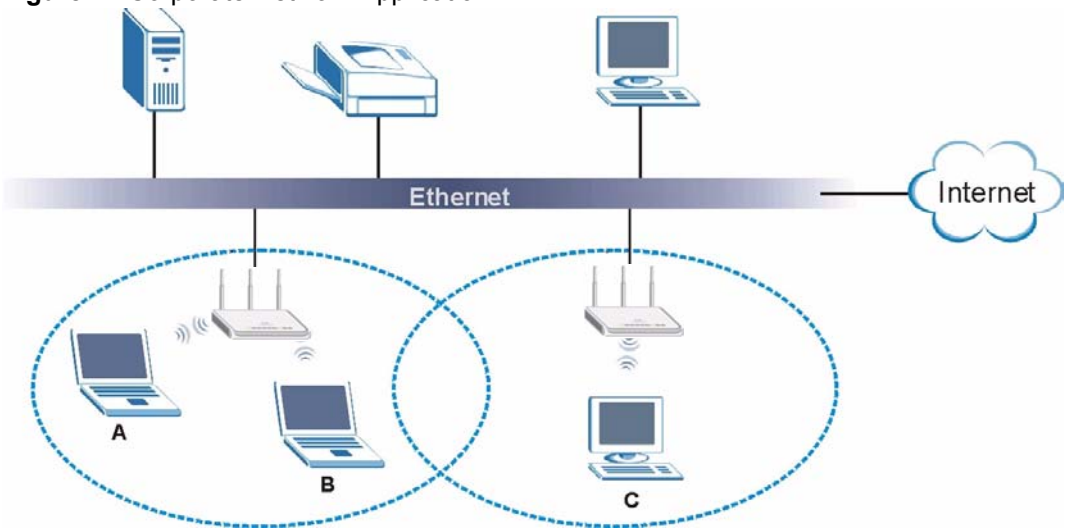


1.2.2 Corporate Network Access Application

In situations where users need to access corporate network resources and the Internet, the ZyXEL Device is an ideal solution for wireless stations to connect to the corporate network without expensive network cabling. Stations A, B and C can access the wired network through the ZyXEL Devices.

The following figure depicts a typical application of the ZyXEL Device in an enterprise environment. The three computers with wireless adapters are allowed to access the network resource through the ZyXEL Device after account validation by the network authentication server.

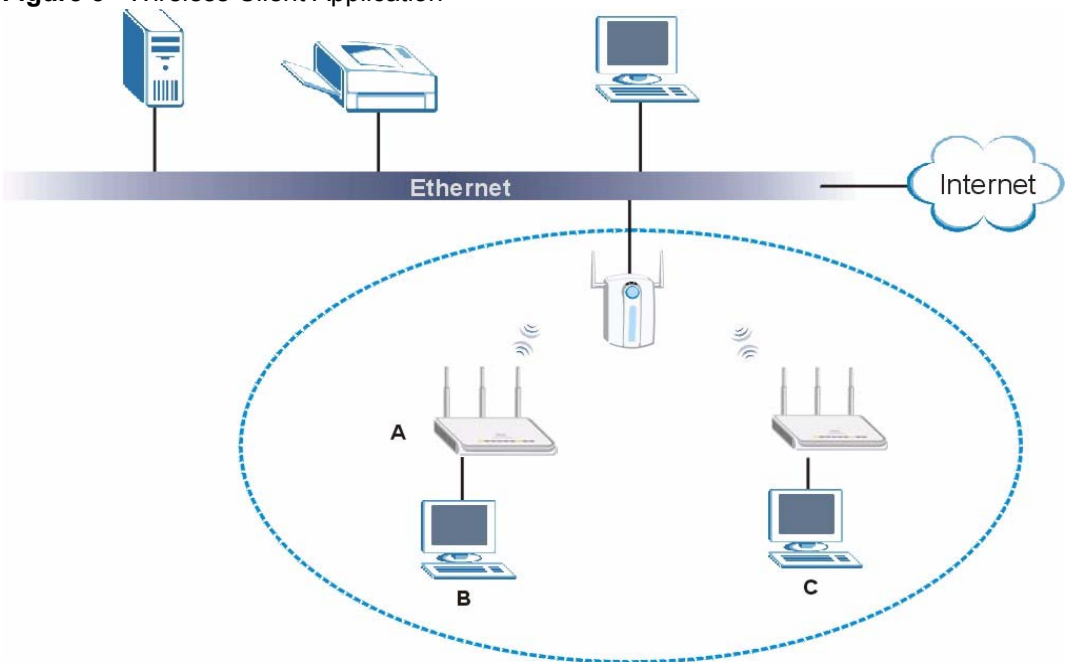
Figure 2 Corporate Network Application



1.2.3 Wireless Client Application

The ZyXEL Device can function as a wireless client to connect to a network via an Access Point (AP). The AP provides access to the wired network and the Internet.

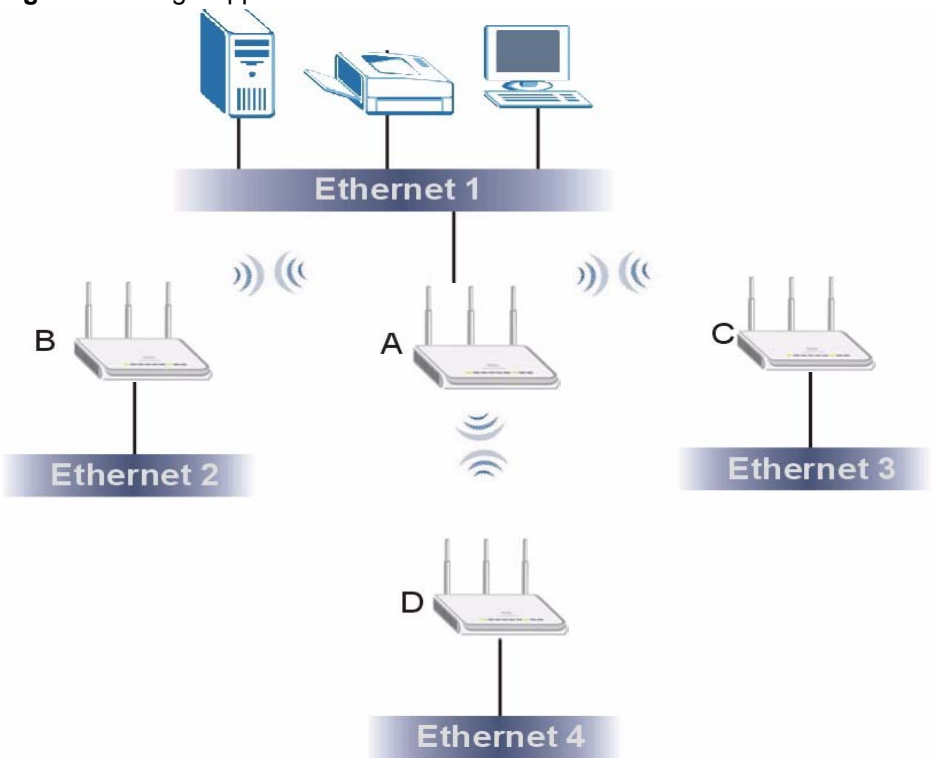
Figure 3 Wireless Client Application



1.2.4 Bridge / Repeater

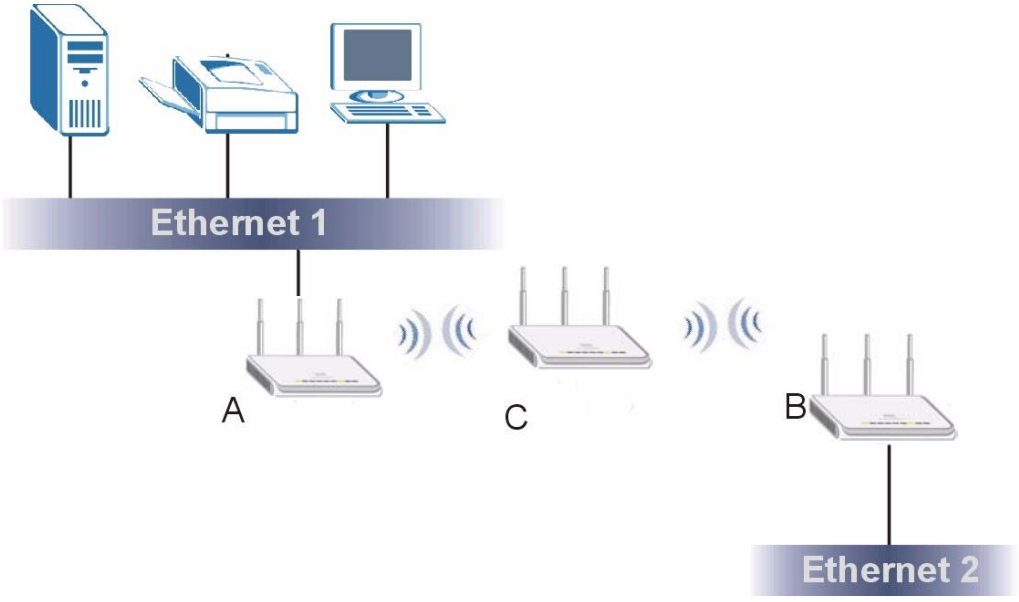
The ZyXEL Device can act as a wireless network bridge and establish wireless links with other APs. The ZyXEL Devices in the following example are using bridge mode with a star configuration. A, B, C and D are connected to independent wired networks and have bridge connections at the same time (B, C and D can communicate with A).

Figure 4 Bridge Application



A ZyXEL Device in bridge mode without an Ethernet connection can function as a repeater. It transmits traffic from one AP to another AP without using a wired connection. C in the following graphic repeats wireless traffic between A and B.

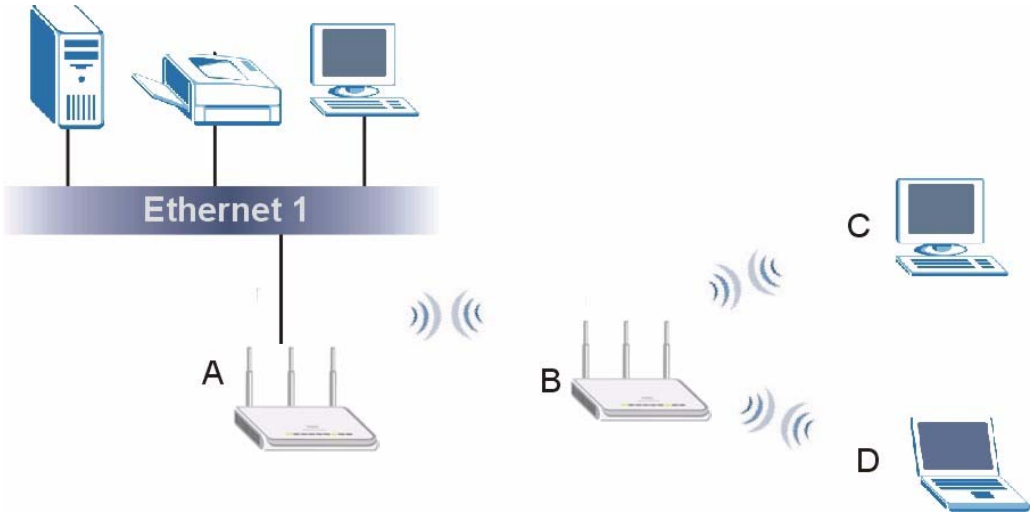
Figure 5 Bridge Repeater Application



1.2.5 Access Point and Repeater

Set the ZyXEL Device to **AP+Repeater** mode to have it simultaneously provide access for wireless clients and use the repeater function. This allows you to extend the coverage of your wireless network without installing Ethernet cable to connect the ZyXEL Device. In the following figure, B is in **AP+Repeater** mode. B functions as an AP for wireless clients C and D. B also repeats traffic between the wireless clients and AP A which is connected to the wired network. You could also set AP A to **AP+Repeater** mode so that wireless clients could connect to A as well.

Figure 6 AP+Repeater Application



1.3 Ways to Manage the ZyXEL Device

Use any of the following methods to manage the ZyXEL Device.

- Web Configurator. This is recommended for everyday management of the ZyXEL Device using a (supported) web browser.
- Command Line Interface. Line commands are mostly used for troubleshooting by service engineers.
- FTP. Use File Transfer Protocol for firmware upgrades and configuration backup/restore.

1.4 Good Habits for Managing the ZyXEL Device

Do the following things regularly to make the ZyXEL Device more secure and to manage the ZyXEL Device more effectively.

- Change the password. Use a password that's not easy to guess and that consists of different types of characters, such as numbers and letters.
- Write down the password and put it in a safe place.

- Back up the configuration (and make sure you know how to restore it). Restoring an earlier working configuration may be useful if the device becomes unstable or even crashes. If you forget your password, you will have to reset the ZyXEL Device to its factory default settings. If you backed up an earlier configuration file, you would not have to totally re-configure the ZyXEL Device. You could simply restore your last configuration.

1.5 LEDs

Figure 7 LEDs

The following table describes the LEDs on the ZyXEL Device.

Table 1 Front Panel LED Description

LED	COLOR	STATUS	DESCRIPTION
POWER	Green	Blinking	The ZyXEL Device is not ready or booting.
		On	The ZyXEL Device has booted successfully and is receiving power.
		Off	The ZyXEL Device is not receiving power.
ETHERNET	Green	Blinking	The ZyXEL Device is sending/receiving data.
		On	The ZyXEL Device has a successful 10 Mbps Ethernet connection.
	Amber	Blinking	The ZyXEL Device is sending/receiving data.
		On	The ZyXEL Device has a successful 100 Mbps Ethernet connection.
		Off	The ZyXEL Device does not have an Ethernet connection.
WLAN	Green	Blinking	The ZyXEL Device is sending or receiving data through the wireless LAN.
		On	The ZyXEL Device is ready, but is not sending/receiving data.
WPS	Green	On	The ZyXEL Device has a WPS connection with another WPS-enabled device.
		Blinking	The ZyXEL Device is setting up a WPS connection with another WPS-enabled device.
		Off	The ZyXEL Device has no WPS connection or has failed to set up a WPS connection with another WPS-enabled device.

1.6 Management Computer Setup

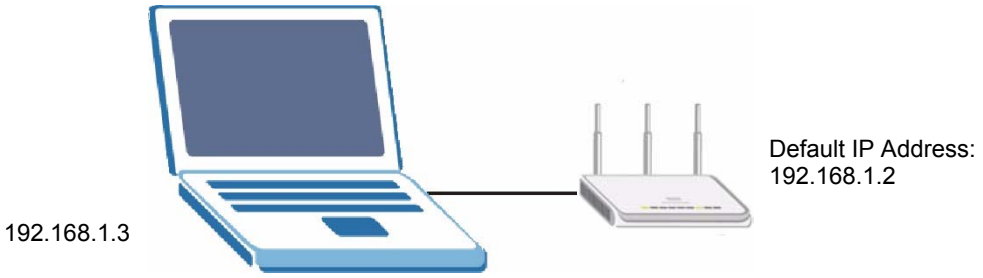
You can connect a computer to the ZyXEL Device for management purposes either using an Ethernet connection (recommended for a first time management session) or wirelessly.

1.6.1 Wired Connection

You must prepare your computer/computer network to connect to the ZyXEL Device if you are using a wired connection. Your computer's IP address and subnet mask must be on the same subnet as the ZyXEL Device. This can be done by setting up your computer's IP address. See the appendix for details on how to set up your IP address.

The following figure shows an example of accessing your ZyXEL Device via a wired connection with an Ethernet cable.

Figure 8 Wired Connection



1.6.2 Wireless Connection

Ensure that the wireless stations have a compatible wireless card/adapter with the same wireless settings as the ZyXEL Device. The following figure shows how you can access your ZyXEL Device wirelessly.

Figure 9 Wireless Connection

The wireless stations and the ZyXEL Device must use the same SSID, channel and wireless security settings for wireless communication.

If you do not enable any wireless security on your ZyXEL Device, your network traffic is visible to any wireless networking device that is within range.

1.7 Restarting the ZyXEL Device

Press and immediately release the **RESET** button to restart the ZyXEL Device.

Holding the RESET button in for five seconds or longer resets the device to the factory-default settings.

1.8 Resetting the ZyXEL Device

If you forget the ZyXEL Device's IP address or your password, to access the ZyXEL Device, you will need to reload the factory-default using the **RESET** button. Resetting the ZyXEL Device replaces the current configuration file with the factory-default configuration file. This means that you will lose all configurations that you had previously. The following parameters will be reset to the default values.

Table 2 Factory Defaults

PARAMETER	DEFAULT VALUE
IP Address	192.168.1.2
Password	1234
Wireless Security	Disabled
SSID	ZyXEL NWA570N

1.8.1 Methods of Restoring Factory-Defaults

You can erase the current configuration and restore factory defaults in two ways:

1. Use the **RESET** button on the ZyXEL Device to upload the default configuration file (hold this button in for at least five seconds).
2. Use the web configurator. Click **System** > **Management** > **Configuration File**. From here you can restore the ZyXEL Device to its factory default settings.

2

Introducing the Web Configurator

This chapter describes how to configure the ZyXEL Device using the Wizard.

2.1 Web Configurator Overview

The web configurator is an HTML-based management interface that allows easy ZyXEL Device setup and management via Internet browser. Use Internet Explorer 6.0 and later or Netscape Navigator 7.0 and later versions. The recommended screen resolution is 1024 by 768 pixels.

In order to use the web configurator you need to allow:

- Web browser pop-up windows from your device. Web pop-up blocking is enabled by default in Windows XP SP (Service Pack) 2.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

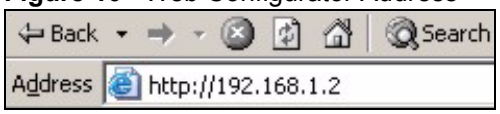
See the **Troubleshooting** chapter for details on how to make sure these functions are allowed in Internet Explorer or Netscape Navigator.

2.2 Accessing the Web Configurator

Follow the steps below to access the web configurator, select a language, change your login password and choose a configuration method from the status screen.

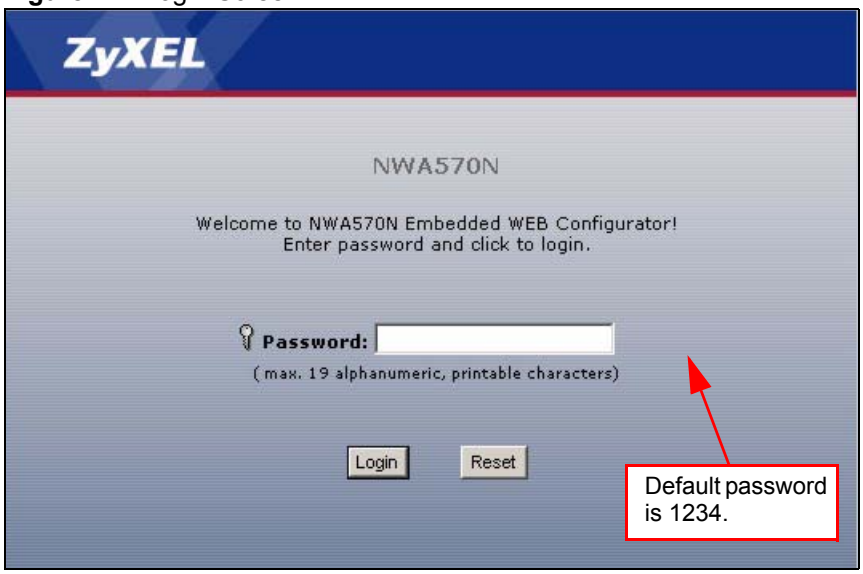
1. Make sure your ZyXEL Device hardware is properly connected (refer to the Quick Start Guide).
2. Prepare your computer/computer network to connect to the ZyXEL Device (refer to the appendix on setting up your IP address).
3. Launch your web browser.
4. Type the IP address of the ZyXEL Device (192.168.1.2 is the default) in the URL bar. Press **Enter**.

Figure 10 Web Configurator Address



5 Type "1234" (default) as the password and click **Login**.

Figure 11 Login Screen

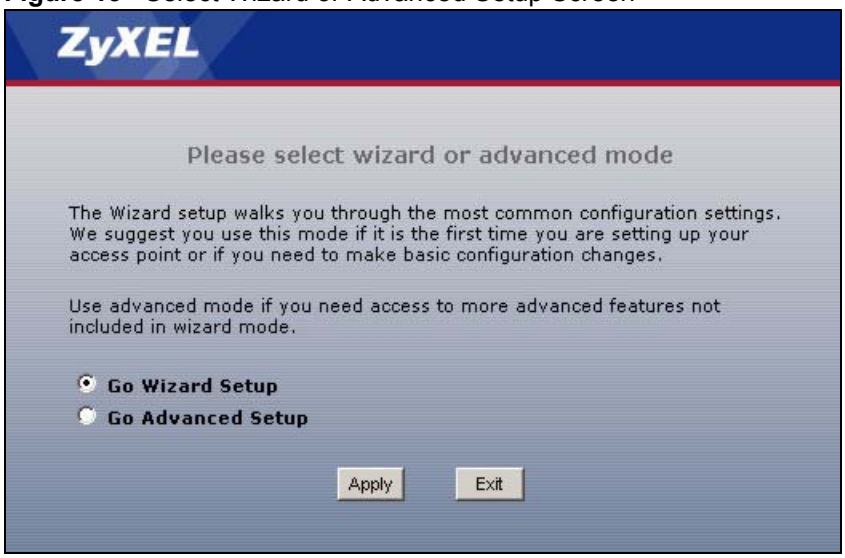


6 Select your language and click **Apply**.

Figure 12 Language Screen

7 The following screen displays. Select **Go Wizard Setup** and click **Apply** to use the wizard setup screens for initial configuration (see Chapter 3 on page 35). Select **Go Advanced Setup** and click **Apply** to go directly to the advanced screens (see Chapter 1 on page 45).

Figure 13 Select Wizard or Advanced Setup Screen


ZyXEL
Please select wizard or advanced mode
The Wizard setup walks you through the most common configuration settings. We suggest you use this mode if it is the first time you are setting up your access point or if you need to make basic configuration changes.
Use advanced mode if you need access to more advanced features not included in wizard mode.
Go Wizard Setup
Go Advanced Setup
Apply
Exit

3

Wizard

This chapter shows you how to configure the ZyXEL Device's basic features using the wizard.

3.1 Using the Wizard

The wizard consist of a series of screens to help you configure your ZyXEL Device for wireless stations to access your wired LAN.

Use the following buttons to navigate the Wizard:

Back	Click **Back** to return to the previous screen.
Next	Click **Next** to continue to the next screen.

No configuration changes will be saved to the ZyXEL Device until you click **Finish**.

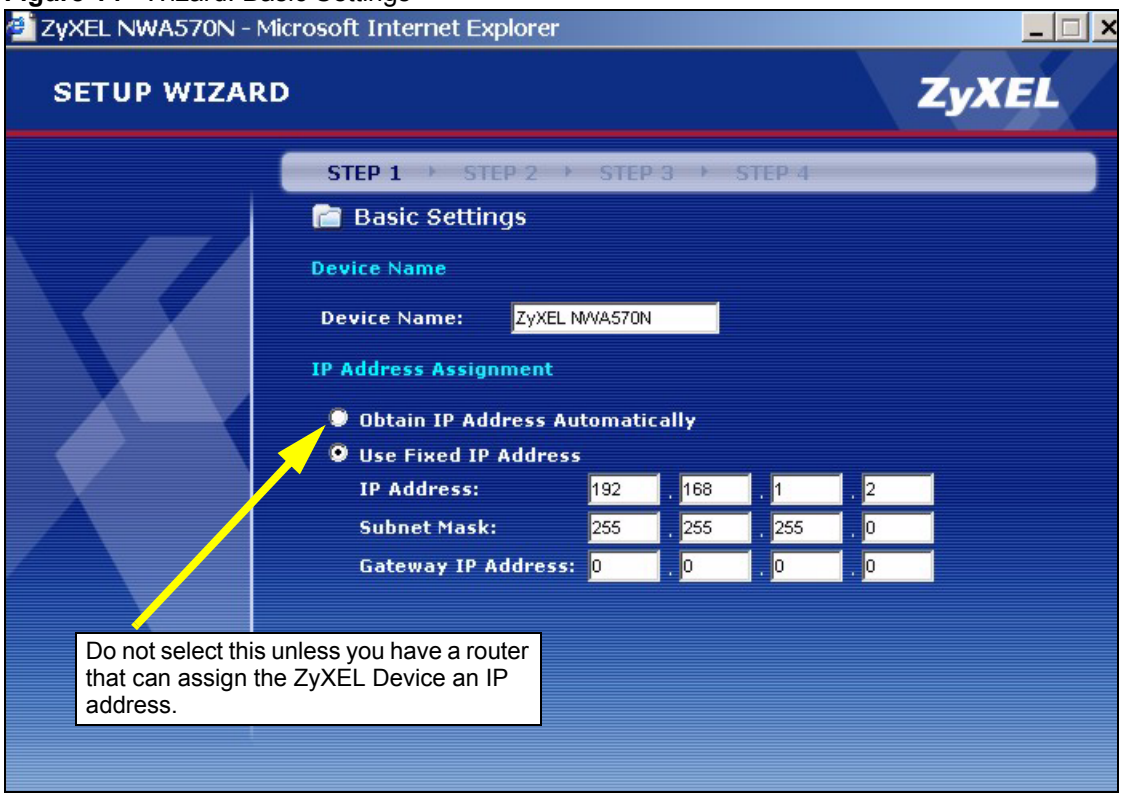
3.1.1 Wizard: Basic Settings

First, log into the ZyXEL Device as shown in Section 2.2 on page 31.

Click **Wizard Setup** to display the first wizard screen shown next. Refer to the **System Screens** chapter for more background information.

1. Enter a descriptive name to identify the device in the Ethernet network.
2. Select **Obtain IP Address Automatically** if you want to put the device behind a router that assigns an IP address. If you select this by mistake, use the **RESET** button to restore the factory default IP address.
3. Select **Use fixed IP Address** to give the device a static IP address. The IP address you configure here is used for management of the device (accessing the web configurator).
4. Enter a **Subnet Mask** appropriate to your network and the **Gateway IP Address** of the neighboring device, if you know it. If you do not, leave the **Gateway IP Address** field as **0.0.0.0**.

Figure 14 Wizard: Basic Settings



3.1.2 Wizard: Wireless Settings

Use this wizard screen to set up the wireless LAN. See the chapter on the wireless screens for background information.

1. The SSID is a unique name to identify the device in a wireless network. Enter up to 32 printable characters. Spaces are allowed. If you change this field on the device, make sure all wireless stations use the same SSID in order to access the network.
2. A wireless device uses a channel to communicate in a wireless network. Select a channel that is not already in use by a neighboring wireless device.

The wireless stations and this device must use the same SSID, channel and wireless security settings for wireless communication.

Figure 15 Wizard: Wireless Settings

ZyXEL NWA570N - Microsoft Internet Explorer
SETUP WIZARD
ZyXEL
STEP 1
STEP 2
STEP 3
STEP 4
Wireless Settings
Wireless Settings
Enter an unique SSID for your wireless network. To associate with this access point, all wireless clients must use the same SSID entered here below
SSID:
ZyXEL NWA570N
Channel:
6
Note:
Unless you're concerned with the interference from other access points, you do not need to change the following default channel

3.1.3 Wizard: Security Settings

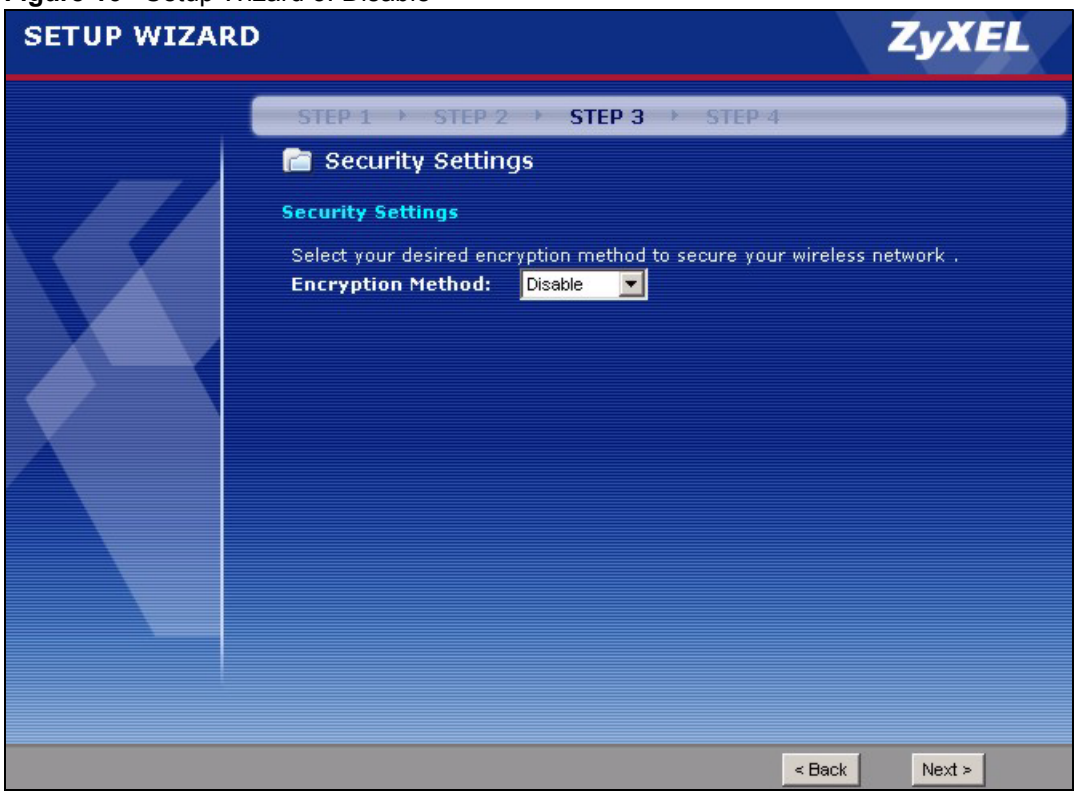
Use this screen to configure security for your wireless LAN. The screen varies depending on what you select in the **Encryption Method** field. Select **Disable** to have no wireless security configured, select **WEP**, or select **WPA-PSK** if your wireless clients support WPA-PSK. Select **WPA2-PSK** if your wireless clients support WPA2-PSK Go to **Wireless** > **Security** if you want WPA2, WPA or 802.1x. See Chapter 6 on page 55 for background information.

3.1.3.1 Disable

Select **Disable** to have no wireless LAN security configured. If you do not enable any wireless security on your device, your network is accessible to any wireless networking device that is within range.

With no wireless security a neighbor can access and see traffic in your network.

Figure 16 Setup Wizard 3: Disable



3.1.3.2 WEP

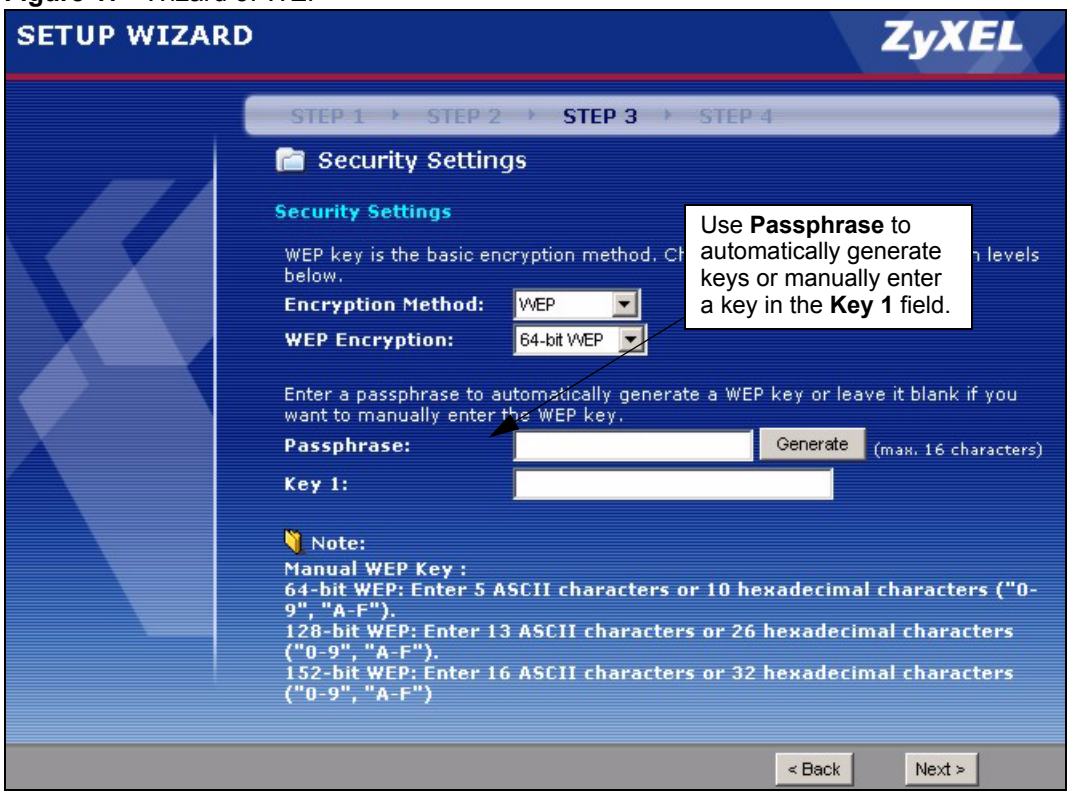
1. WEP (Wired Equivalent Privacy) encrypts data frames before transmitting over the wireless network. Select **64-bit**, **128-bit** or **152-bit** from the **WEP Encryption** drop-down list box and then follow the on-screen instructions to set up the WEP keys.
2. Choose an encryption level from the drop-down list. The higher the WEP encryption, the higher the security but the slower the throughput.
3. You can generate or manually enter a WEP key.

- If you selected 64-bit or 128-bit WEP, you can enter a **Passphrase** (up to 32 printable characters) and click **Generate**. The device automatically generates WEP keys. One key displays in the **Key 1** field. Go to **Wireless** > **Security** if you want to see the other WEP keys.

  or

- Enter a manual key in the **Key 1** field.

Figure 17 Wizard 3: WEP


SETUP WIZARD
ZyXEL
STEP 1
STEP 2
STEP 3
STEP 4
Security Settings
Security Settings
WEP key is the basic encryption method. Ch
levels
below.
Encryption Method:
WEP
WEP Encryption:
64-bit WEP
Use Passphrase to automatically generate keys or manually enter a key in the Key 1 field.
Enter a passphrase to automatically generate a WEP key or leave it blank if you want to manually enter the WEP key.
Passphrase:
Generate
(max. 16 characters)
Key 1:
Note:
Manual WEP Key :
64-bit WEP: Enter 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F").
128-bit WEP: Enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F").
152-bit WEP: Enter 16 ASCII characters or 32 hexadecimal characters ("0-9", "A-F")
< Back
Next >

3.1.3.3 WPA(2)-PSK

Only select **WPA-PSK** or **WPA2-PSK** if your wireless clients support it.

Type a pre-shared key from 8 to 63 ASCII characters (including spaces and symbols). This field is case-sensitive.

Figure 18 Wizard 3: WPA(2)-PSK

3.1.4 Wizard: Confirm Your Settings

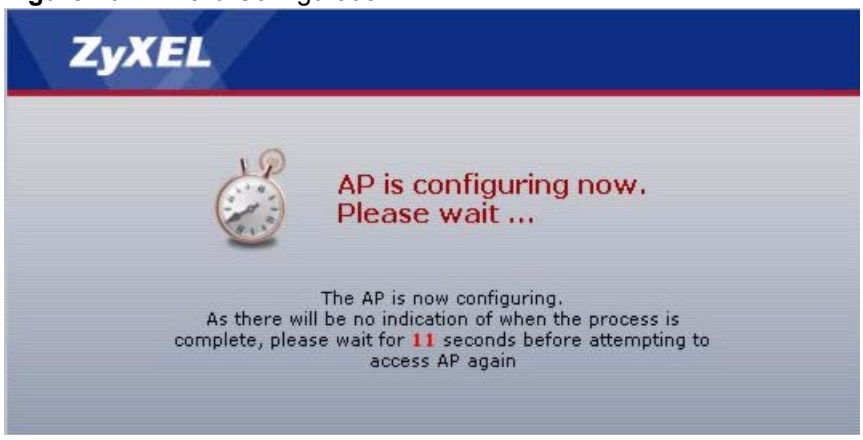
This read-only screen shows the status of the current settings. Use the summary table to check whether what you have configured is correct. Click **Finish** to complete the wizard configuration and save your settings.

Figure 19 Wizard: Confirm Your Settings

3.1.5 Auto-Configuration

The Wizard automatically configures the ZyXEL Device.

Figure 20 Wizard Configuration


ZyXEL
AP is configuring now.
Please wait ...
The AP is now configuring.
As there will be no indication of when the process is complete, please wait for 11 seconds before attempting to access AP again

For more detailed background information, see the rest of this User's Guide.

PART II
Advanced

Status Screen (45)
System Screen (51)
Wireless Screens (55)
Management Screens (83)

4

Status Screen

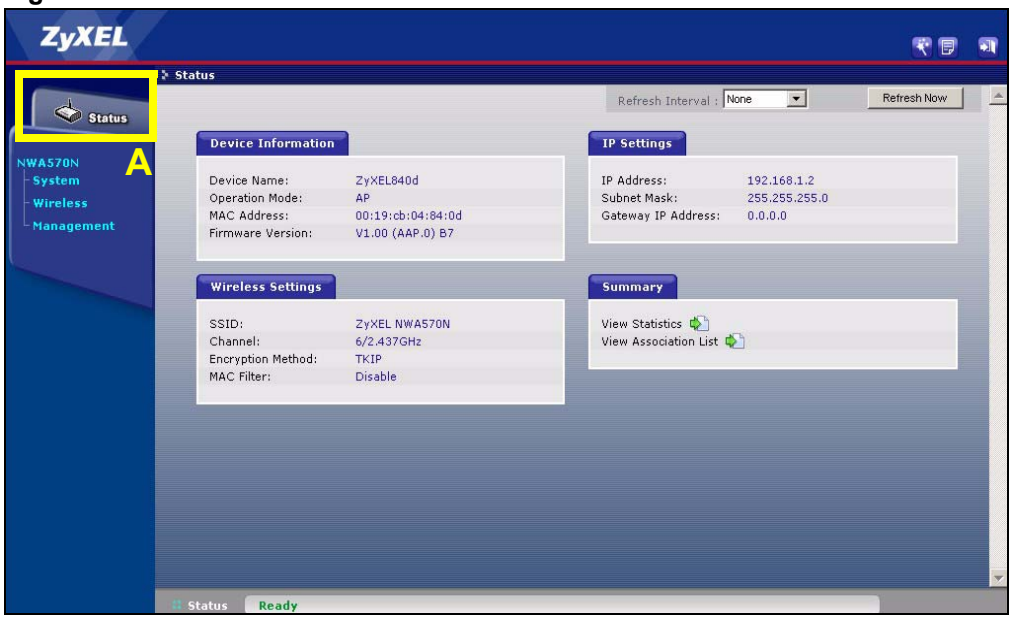
This chapter describes the Status screen.

4.1 Status Screen

The **Status** screen display a snapshot of your device's settings. You can also view network statistics and a list of wireless stations currently associated with your device. Note that these labels are READ-ONLY and are meant to be used for diagnostic purposes.

You can reach this by clicking on **Advanced** after logging in, or by clicking on the **Status** tab (**A**) from any screen.

Figure 21 Status Screen



4.1.1 Status Screen Icons

The following table describes the global web configurator icons (in the upper right corner of most screens).

Table 3 Global Icon Key

ICON	DESCRIPTION
	Click the **Wizard** icon to open the setup wizard.
	Click the **About** icon to view copyright information.
	Click the **Logout** icon at any time to exit the web configurator. Make sure you save any changes before you log out.

4.1.2 Status Screen Details

The status screen provides details on your ZyXEL Device, wireless settings, IP settings, as well as statistics and associated device details.

Figure 22 Status Screen Details

The following table describes the labels in this screen.

Table 4 Status

LABEL	DESCRIPTION
Refresh Interval	Use the drop-down list box to select how often you want the device to renew the information on this screen.
Refresh Now	Click this button to have the device renew the information on this screen.
Device Information	
Device Name	This is the same as the device name you entered in the first wizard screen if you entered one there. It is for identification purposes.
Operation Mode	This field shows whether the device is functioning as an access point, a wireless client, a bridge or an access point and repeater.
MAC Address	This field displays the MAC address of the device. The MAC (Media Access Control) or Ethernet address on a LAN (Local Area Network) is unique to your computer. A network interface card such as an Ethernet adapter has a hardwired address that is assigned at the factory. This address follows an industry standard that ensures no other adapter has a similar address.

Table 4 Status

LABEL	DESCRIPTION
Firmware Version	This is the firmware version and the date the firmware was created.
IP Settings	
IP Address	This is the Ethernet port IP address.
Subnet Mask	This is the Ethernet port subnet mask.
Gateway IP Address	This is the IP address of a gateway. Leave this field as **0.0.0.0** if you do not know it.
Wireless Settings	
SSID	This is the descriptive name used to identify the device in a wireless network.
Channel	This field displays the radio channel the device is currently using.
Encryption Method	This field shows the type of data encryption that is enabled on the wireless network: **WEP** (WEP or 802.1x) **TKIP** (WPA or WPA-PSK) **AES** (WPA2 or WPA2-PSK) **TKIP + AES** (WPA & WPA2 or WPA-PSK & WPA2-PSK) or **Disable** (no security)
MAC Filter	This field shows whether MAC filter is enabled or not. With MAC filtering, you can allow or deny access to the device based on the MAC addresses of the wireless stations.
View Statistics	Click **View Statistics** to see performance statistics such as number of packets sent and number of packets received.
View Association List	Click **View Association List** to show the wireless stations that are currently associated to the device.

4.1.3 Navigation Panel

After you enter the password, use the links on the navigation panel to go to the various screens.

The following table describes the sub-menus.

Table 5 Screens Summary

LINK	TAB	FUNCTION
Status		This screen shows the ZyXEL Device's general device, system and interface status information. Use this screen to access the wizard, and summary statistics tables.
System		Use this screen to configure the device name and IP address assignment settings.
Wireless	Wireless Settings	Use this screen to configure the wireless LAN.
	Security	Use this screen to configure the wireless LAN's security settings.
	MAC Filter	Use the MAC filter screen to configure the ZyXEL Device to block or allow only certain devices to associate with the ZyXEL Device.
	WPS settings	This shows the status of Wi-Fi Protected Setup (WPS) on your device.

Table 5 Screens Summary

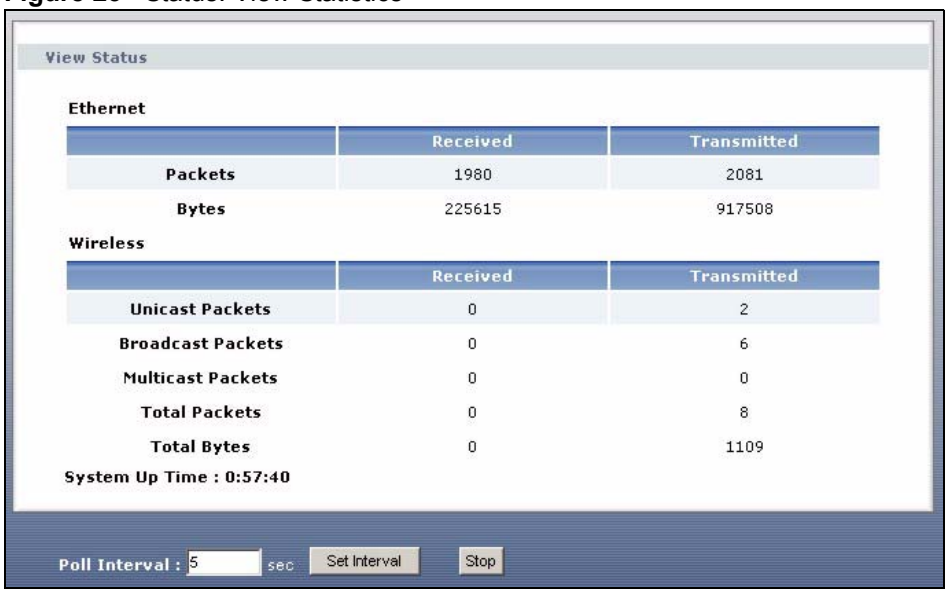
LINK	TAB	FUNCTION
Management	Password	Use this screen to configure the administrator password.
	Logs	Use this screen to view logs and alert messages.
	Configuration	Use this screen to backup and restore the configuration or reset the factory defaults to your ZyXEL Device.
	F/W Upload	Use this screen to upload firmware to your ZyXEL Device.

4.2 System Status

4.2.1 Statistics

Click **View Statistics** in the **Status** screen. This screen displays read-only information including port status and packet specific statistics. Also provided are "system up time" and "poll interval(s)". The **Poll Interval(s)** field is configurable.

Figure 23 Status: View Statistics



The following table describes the labels in this screen.

Table 6 Status: View Statistics

LABEL	DESCRIPTION
Ethernet	
Packets	This row displays the numbers of packets received and transmitted by the Ethernet port.
Bytes	This row displays the numbers of bytes received and transmitted by the Ethernet port.
Wireless	
Unicast Packets	This row displays the numbers of unicast packets received and transmitted by the wireless adapter.

Table 6 Status: View Statistics

LABEL	DESCRIPTION
Broadcast Packets	This row displays the numbers of broadcast packets received and transmitted by the wireless adapter.
Multicast Packets	This row displays the numbers of multicast packets received and transmitted by the wireless adapter.
Total Packets	This row displays the numbers of all types of packets received and transmitted by the wireless adapter.
Total Bytes	This row displays the numbers of bytes received and transmitted by the wireless adapter.
System Up Time	This is the total time the device has been on.
Poll Interval(s)	Enter the time interval for refreshing statistics.
Set Interval	Click this button to apply the new poll interval you entered above.
Stop	Click this button to stop refreshing statistics.

4.2.2 Association List

Click **Status** and then the **View Association List** button to display the **Association List** screen. When the device is not in wireless client mode, this screen displays which wireless stations are currently associated to the device in the **Association List** screen.

Figure 24 Status: View Association List

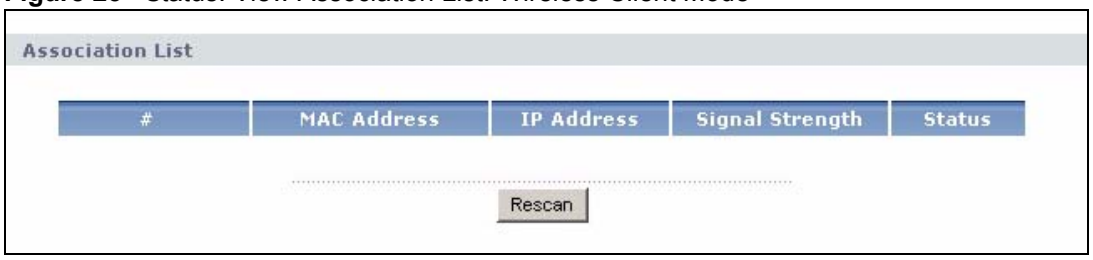
The following table describes the labels in this screen.

Table 7 Status: View Association List

LABEL	DESCRIPTION
#	This is the index number of an associated wireless station.
MAC Address	This field displays the MAC address of an associated wireless station.
IP Address	This field displays the IP address of an associated wireless station.
Signal Strength	This field displays the signal strength of each associated wireless station.
Status	This field displays **Associated** for associated wireless stations.
Rescan	Click **Rescan** to check for associated wireless stations.

When the device is in wireless client mode, this screen displays details of the access point to which the ZyXEL Device is associated.

Figure 25 Status: View Association List: Wireless Client Mode



The following table describes the labels in this screen.

Table 8 Status: View Association List: Wireless Client Mode

LABEL	DESCRIPTION
#	This is the index number of an associated access point.
MAC Address	This field displays the MAC address of the associated access point.
IP Address	This field displays the IP address of the associated access point.
Signal Strength	This field displays the signal strength of the associated access point.
Status	This field displays **Associated** for an associated access point.
Rescan	Click **Rescan** to check for associated wireless stations.

See the rest of this User's Guide for configuration details and background information on all features using the web configurator.

5

System Screen

This chapter provides information on the **System** screen.

5.1 TCP/IP Parameters

5.1.1 IP Address Assignment

Every computer on the Internet must have a unique IP address. If your networks are isolated from the Internet, for instance, only between your two branch offices, you can assign any IP addresses to the hosts without problems. However, the Internet Assigned Numbers Authority (IANA) has reserved the following three blocks of IP addresses specifically for private networks.

Table 9 Private IP Address Ranges

10.0.0.0	-	10.255.255.255
172.16.0.0	-	172.31.255.255
192.168.0.0	-	192.168.255.255

You can obtain your IP address from the IANA, from an ISP or have it assigned by a private network. If you belong to a small organization and your Internet access is through an ISP, the ISP can provide you with the Internet addresses for your local networks. On the other hand, if you are part of a much larger organization, you should consult your network administrator for the appropriate IP addresses.

Regardless of your particular situation, do not create an arbitrary IP address; always follow the guidelines above. For more information on address assignment, please refer to RFC 1597, Address Allocation for Private Internets and RFC 1466, Guidelines for Management of IP Address Space.

5.1.2 IP Address and Subnet Mask

Similar to the way houses on a street share a common street name, computers on a LAN share one common network number.

Where you obtain your network number depends on your particular situation. If the ISP or your network administrator assigns you a block of registered IP addresses, follow their instructions in selecting the IP addresses and the subnet mask.

If the ISP did not explicitly give you an IP network number, then most likely you have a single user account and the ISP will assign you a dynamic IP address when the connection is established. The Internet Assigned Number Authority (IANA) reserved this block of addresses specifically for private use; please do not use any other number unless you are told otherwise. Let's say you select 192.168.1.0 as the network number; which covers 254 individual addresses, from 192.168.1.1 to 192.168.1.254 (zero and 255 are reserved). In other words, the first three numbers specify the network number while the last number identifies an individual computer on that network.

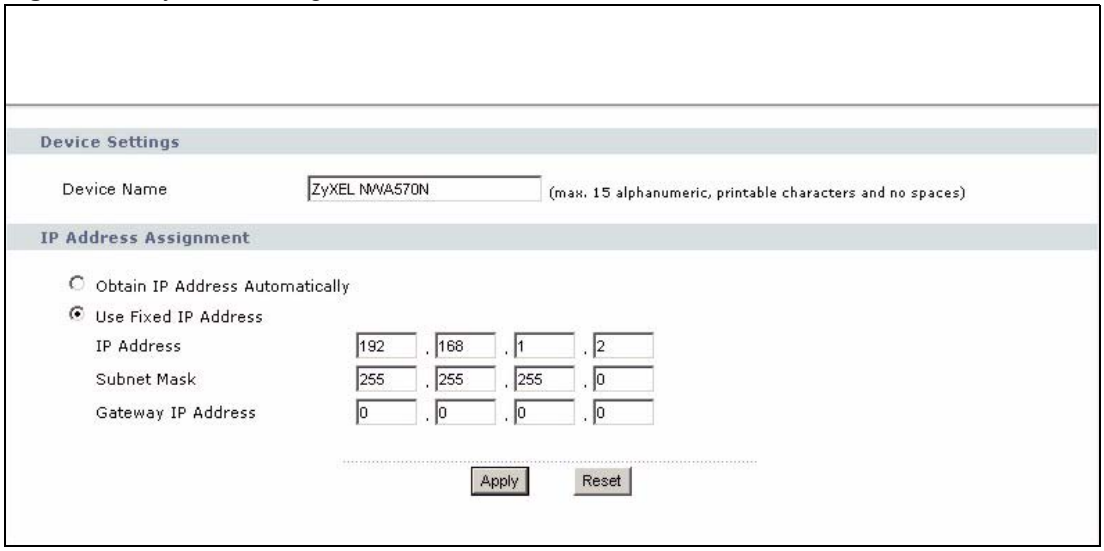
Once you have decided on the network number, pick an IP address that is easy to remember, for instance, 192.168.1.2, for your device, but make sure that no other device on your network is using that IP address.

The subnet mask specifies the network number portion of an IP address. Your device will compute the subnet mask automatically based on the IP address that you entered. You don't need to change the subnet mask computed by the device unless you are instructed to do otherwise.

5.2 System Settings

Click **System** to open the **System Settings** screen.

Figure 26 System Settings



The following table describes the labels in this screen.

Table 10 System Settings

LABEL	DESCRIPTION
Device Name	This name can be up to 30 printable characters long. Spaces are allowed.
IP Address Assignment	

Table 10 System Settings

LABEL	DESCRIPTION
Obtain IP Address Automatically	Select this option to have your device use a dynamically assigned IP address from a router each time.
Use fixed IP address	Select this option to have your device use a static IP address. When you select this option, fill in the fields below.
IP Address	Enter the IP address of your device in dotted decimal notation.
Subnet Mask	Enter the subnet mask.
Gateway IP Address	Type the IP address of the gateway. The gateway is a router or switch on the same network segment as the device. The gateway helps forward packets to their destinations. Leave this field as **0.0.0.0** if you do not know it.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to reload the previous configuration for this screen.

6

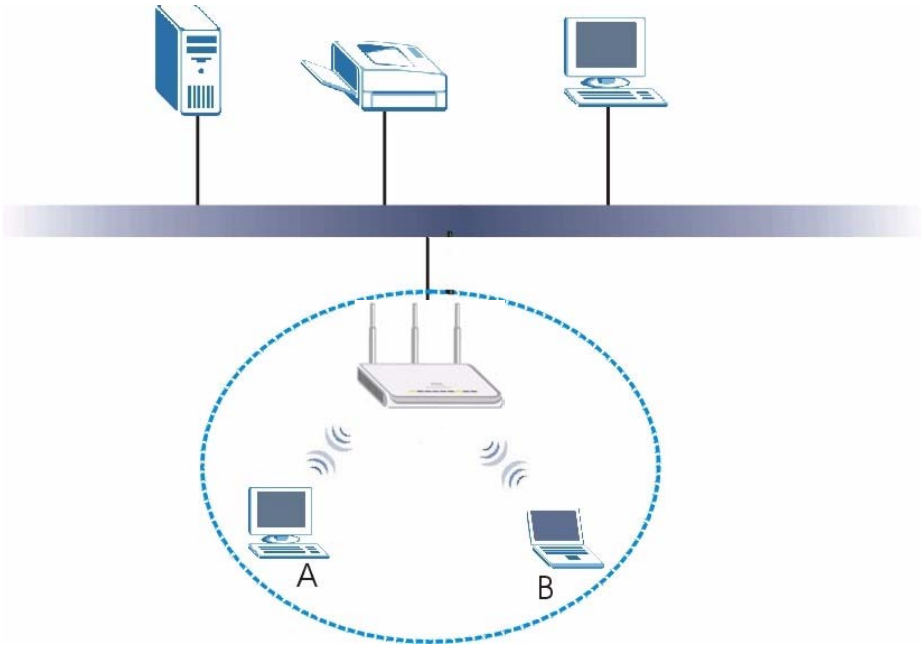
Wireless Screens

This chapter discusses how to configure the wireless network settings in your NWA570N. See the appendices for more detailed information about wireless networks.

6.1 Wireless Network Overview

The following figure provides an example of a wireless network.

Figure 27 Example of a Wireless Network



The wireless network is the part in the blue circle. In this wireless network, devices **A** and **B** use the access point (**AP**) to interact with the other devices (such as the printer) or with the Internet. Your NWA570N is the AP.

Every wireless network must follow these basic guidelines.

- Every device in the same wireless network must use the same SSID.
  The SSID is the name of the wireless network. It stands for Service Set IDentity.
- If two wireless networks overlap, they should use a different channel.

Like radio stations or television channels, each wireless network uses a specific channel, or frequency, to send and receive information.

- Every device in the same wireless network must use security compatible with the AP.

  Security stops unauthorized devices from using the wireless network. It can also protect the information that is sent in the wireless network.

6.2 Wireless Security Overview

The following sections introduce different types of wireless security you can set up in the wireless network.

6.2.1 SSID

Normally, the NWA570N acts like a beacon and regularly broadcasts the SSID in the area. You can hide the SSID instead, in which case the NWA570N does not broadcast the SSID. In addition, you should change the default SSID to something that is difficult to guess.

This type of security is fairly weak, however, because there are ways for unauthorized wireless devices to get the SSID. In addition, unauthorized wireless devices can still see the information that is sent in the wireless network.

6.2.2 MAC Address Filter

Every device that can use a wireless network has a unique identification number, called a MAC address.[1] A MAC address is usually written using twelve hexadecimal characters[2]; for example, 00A0C5000002 or 00:A0:C5:00:00:02. To get the MAC address for each device in the wireless network, see the device's User's Guide or other documentation.

You can use the MAC address filter to tell the NWA570N which devices are allowed or not allowed to use the wireless network. If a device is allowed to use the wireless network, it still has to have the correct information (SSID, channel, and security). If a device is not allowed to use the wireless network, it does not matter if it has the correct information.

This type of security does not protect the information that is sent in the wireless network. Furthermore, there are ways for unauthorized wireless devices to get the MAC address of an authorized device. Then, they can use that MAC address to use the wireless network.

6.2.3 User Authentication

Authentication is the process of verifying whether a wireless device is allowed to use the wireless network. You can make every user log in to the wireless network before they can use it. However, every device in the wireless network has to support IEEE 802.1x to do this.

For wireless networks, you can store the user names and passwords for each user in a RADIUS server. This is a server used in businesses more than in homes. If you do not have a RADIUS server, you cannot set up user names and passwords for your users.

1. Some wireless devices, such as scanners, can detect wireless networks but cannot use wireless networks. These kinds of wireless devices might not have MAC addresses.
2. Hexadecimal characters are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

Unauthorized wireless devices can still see the information that is sent in the wireless network, even if they cannot use the wireless network. Furthermore, there are ways for unauthorized wireless users to get a valid user name and password. Then, they can use that user name and password to use the wireless network.

6.2.4 Encryption

Wireless networks can use encryption to protect the information that is sent in the wireless network. Encryption is like a secret code. If you do not know the secret code, you cannot understand the message.

The types of encryption you can choose depend on the type of authentication. (See Section 6.2.3 on page 56 for information about this.)

Table 11 Types of Encryption for Each Type of Authentication

	NO AUTHENTICATION	RADIUS SERVER
Weakest	No Security	WPA
	Static WEP	
↕	WPA-PSK	
Strongest	WPA2-PSK	WPA2

For example, if the wireless network has a RADIUS server, you can choose **WPA** or **WPA2**. If users do not log in to the wireless network, you can choose no encryption, **Static WEP**, **WPA-PSK**, or **WPA2-PSK**.

Usually, you should set up the strongest encryption that every device in the wireless network supports. For example, suppose you have a wireless network with the NWA570N and you do not have a RADIUS server. Therefore, there is no authentication. Suppose the wireless network has two devices. Device A only supports WEP, and device B supports WEP and WPA. Therefore, you should set up **Static WEP** in the wireless network.

It is recommended that wireless networks use **WPA-PSK**, **WPA**, or stronger encryption. The other types of encryption are better than none at all, but it is still possible for unauthorized wireless devices to figure out the original information pretty quickly.

When you select **WPA2** or **WPA2-PSK** in your NWA570N, you can also select an option (**WPA compatible**) to support WPA as well. In this case, if some of the devices support WPA and some support WPA2, you should set up **WPA2-PSK** or **WPA2** (depending on the type of wireless network login) and select the **WPA compatible** option in the NWA570N.

Many types of encryption use a key to protect the information in the wireless network. The longer the key, the stronger the encryption. Every device in the wireless network must have the same key.

6.3 Additional Wireless Terms

The following table describes wireless network terms and acronyms used in the NWA570N's Web Configurator.

Table 12 Additional Wireless Terms

TERM	DESCRIPTION
Intra-BSS Traffic	This describes direct communication (not through the NWA570N) between two wireless devices within a wireless network. You might disable this kind of communication to enhance security within your wireless network.
RTS/CTS Threshold	In a wireless network which covers a large area, wireless devices are sometimes not aware of each other's presence. This may cause them to send information to the AP at the same time and result in information colliding and not getting through. By setting this value lower than the default value, the wireless devices must sometimes get permission to send information to the NWA570N. The lower the value, the more often the devices must get permission. If this value is greater than the fragmentation threshold value (see below), then wireless devices never have to get permission to send information to the NWA570N.
Preamble	A preamble affects the timing in your wireless network. There are two preamble modes: long and short. If a device uses a different preamble mode than the NWA570N does, it cannot communicate with the NWA570N.
Authentication	The process of verifying whether a wireless device is allowed to use the wireless network.
Max. Frame Burst	Enable this to improve the performance of both pure IEEE 802.11g and mixed IEEE 802.11b/g networks. Maximum Frame Burst sets the maximum time that the NWA570N transmits IEEE 802.11g wireless traffic only.
Fragmentation Threshold	A small fragmentation threshold is recommended for busy networks, while a larger threshold provides faster performance if the network is not very busy.
Roaming	If you have two or more NWA570Ns (or other wireless access points) on your wireless network, you can enable this option so that wireless devices can change locations without having to log in again. This is useful for devices, such as notebooks, that move around a lot.

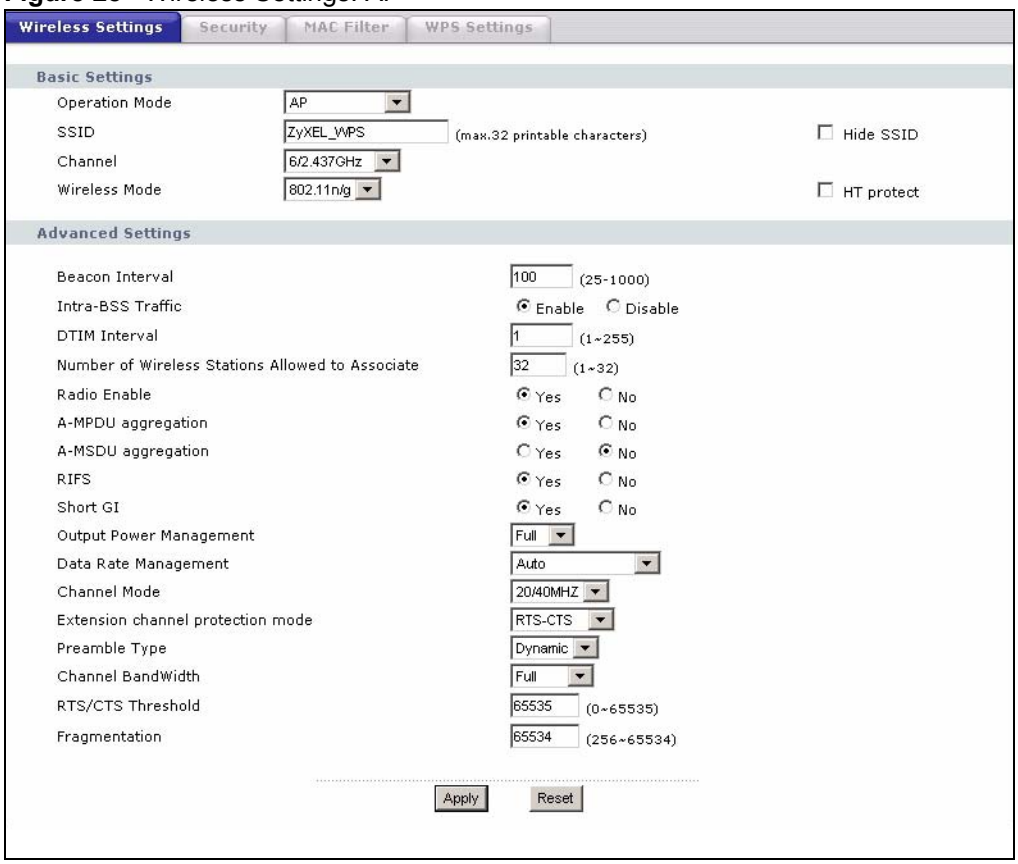
6.4 Configuring Wireless

Click **Wireless** to display the **Wireless Settings** screen.The screen varies depending upon the operation mode you select.

6.4.1 Access Point Mode

Select **Access Point** in the **Operation Mode** field to display the screen as shown next. This mode has the device act as an access point (AP) through which wireless stations can communicate and/or access a wired network.

Figure 28 Wireless Settings: AP



The following table describes the labels in this screen.

Table 13 Wireless Settings: AP

LABEL	DESCRIPTION
Basic Settings	
Operation Mode	Select the operating mode from the drop-down list. The options are **Access Point**, **Wireless Client**, **Bridge** and **AP+Repeater**.
SSID	Wireless stations associating to the access point (AP) must have the same SSID. Enter a descriptive name (up to 32 printable characters) for the wireless LAN. Spaces are allowed. Note: If you are configuring the device from a computer connected to the wireless LAN and you change the device's SSID, channel or security settings, you will lose your wireless connection when you press **Apply** to confirm. You must then change the wireless settings of your computer to match the device's new settings.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through passive scanning using a site survey tool.
Channel	The range of radio frequencies used by IEEE 802.11b/g wireless devices is called a channel. Select a wireless channel if interference from other nearby devices is a problem. The NWA570N and wireless devices in your network must use the same channel.

Table 13 Wireless Settings: AP (continued)

LABEL	DESCRIPTION
Wireless Mode	Select **802.11b/g** to allow IEEE 802.11b and IEEE 802.11g compliant WLAN devices to associate with the device. Select **802.11n/g** to allow IEEE 802.11n and IEEE 802.11g compliant WLAN devices to associate with the device.
HT protect	Select **HT protect** if you have devices on your wireless network that support IEEE 802.1b/g standards but not the IEEE 802.1n draft 2.0 standard. If all devices on your wireless network support IEEE 802.1n draft 2.0, deselect **HT protect** for higher data transmission rates.
Advanced Settings	
Beacon Interval	A beacon transmits important information to stations on the wireless network. Set the number of milliseconds that should pass between the sending out of beacons. Selecting a low number increases the frequency of beacons. This increases network overhead, but improves wireless device association and roaming. However, it also reduces power saving as wireless stations in sleep mode must awaken more often. Selecting a high number reduces the frequency of beacons, reducing network overhead, increasing data transmission rates and increasing power savings. However, association of wireless devices and roaming becomes more difficult.
Intra-BSS Traffic	A Basic Service Set (BSS) exists when all communications between wireless clients or between a wireless client and a wired network client go through one access point (AP). Intra-BSS traffic is traffic between wireless stations in the same BSS. Enable **Intra-BSS Traffic** to allow wireless stations connected to the device to communicate with each other. Disable **Intra-BSS Traffic** to only allow wireless stations to communicate with the wired network, not with each other. This option is more secure. See Appendix C on page 125 for more information.
DTIM Interval	Set the interval for wireless clients in sleep mode to wake up and check for multicast or broadcast traffic. The AP includes a Delivery Traffic Indication Message (DTIM) in the beacon to notify wireless clients in sleep mode that there is a multicast or broadcast packet awaiting delivery. The DTIM interval is a multiple of the beacon interval. For example, if the beacon interval is 100 milliseconds and the DTIM interval is 2, the AP includes a DTIM with every second beacon (or every 200 milliseconds).
Number of Wireless Stations Allowed to Associate:	Use this field to set a maximum number of wireless stations that may connect to the device. Enter the number (from 1 to 32) of wireless stations allowed.
Radio Enable	Turn on the wireless adapter to allow wireless communications between the device and other IEEE 802.11b/g and IEEE 802.11n draft 2.0 compliant wireless devices. Turn off the wireless adapter to stop wireless communications between the device and other IEEE 802.11b/g and IEEE 802.11n draft 2.0 compliant wireless devices.
A-MPDU aggregation	Select **Yes** to enable the grouping of several A-MSDU (Aggregate MAC Service Data Units) into one large A-MPDU (Aggregate MAC Protocol Data Unit). When combined with **A-MSDU aggregation** this function allows faster data transfer rates.
A-MSDU aggregation	Select **Yes** to enable the grouping of small groups of data (MAC Service Data Units, or MSDU) into one large unit of MSDUs called an Aggregate MSDU (A-MSDU).
RIFS	Select **Yes** to enable **RIFS** (Reduced Interframe Spacing) and to increase data transfer rates.

Table 13 Wireless Settings: AP (continued)

LABEL	DESCRIPTION
Short GI	Select **Yes** or **No** to enable or disable **GI** (Guard Interval). The GI refers to the interval given between data transmission from users in order to reduce interference. Reducing the **GI** increases data transfer rates but also increases interference. Increasing the **GI** reduces data transfer rates but also reduces interference.
Output Power Management	Set the output power of the device in this field. The options are **Full**, **50%**, **25%**, **12%** and **Min**. **Full** is recommended. If there is a high density of APs within an area, decrease the output power of the device to reduce interference with other APs.
Data Rate Management	Use this field to select a maximum data rate for the wireless connection(s). The options are **Auto**, **1** ~ **54M**, or **MCS0-7.2[15]** ~ **MCS15-144.4[300]**. Select **Auto** to let the NWA570N decide the most suitable data transfer rate. If you are not certain of what setting to choose, choose **Auto**. Alternatively select a maximum data transfer rate from 1 to 54 Mbps. Please note that this is a total rate to be shared by all of the device's wireless connections. The NWA570N also lets you configure the maximum data transfer rate based on the IEEE802.1n draft 2.0 modulation and coding scheme (MCS). The MCS lists data transfer speeds given a set of factors affecting network data transfer rates. Such factors include GI and bandwidth. The "MCS0" in the **MCS0-7.2[15]** option refers to the first set of network conditions and so on. So **MCS0-7.2[15]** is appropriate for network conditions which provides data transfer rates of 7.2 Mbps and 15 Mbps at bandwidths of 20 Mhz and 40 Mhz respectively. For more information on the MCS see the IEEE802.1n draft 2.0 specifications.
Channel Mode	Select whether the NWA570N uses a wireless channel bandwidth of 20 or 40 MHz. A standard 20 MHz channel offers transfer speeds of up to 150Mbps whereas a 40MHz channel uses two standard channels and offers speeds of up to 300 Mbps. Because not all devices support 40 MHz channels, select **20/40MHZ** to allow the NWA570N to adjust the channel bandwidth automatically.
Extension channel protection mode	If you have only IEEE wireless 802.1n draft 2.0 compatible devices on your network, select **None**. If you have devices that are not compatible with IEEE wireless 802.1n draft 2.0 and you have selected a **Channel Mode** of 40 Mhz, select **CTS to self**. **CTS to self** and **RTS-CTS** are both kinds of protection mechanisms, similar to **HT protect**. Both decrease data transfer speeds but **CTS to self** is more efficient.
Preamble Type	Preamble is used to signal that data is coming to the receiver. Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b compliant wireless adapters support long preamble, but not all support short preamble. Select **Long** preamble if you are unsure what preamble mode the wireless adapters support, and to provide more reliable communications in busy wireless networks. Select **Dynamic** to have the device automatically use short preamble when all wireless clients support it, otherwise the device uses long preamble. Note: The device and the wireless stations MUST use the same preamble mode in order to communicate.

Table 13 Wireless Settings: AP (continued)

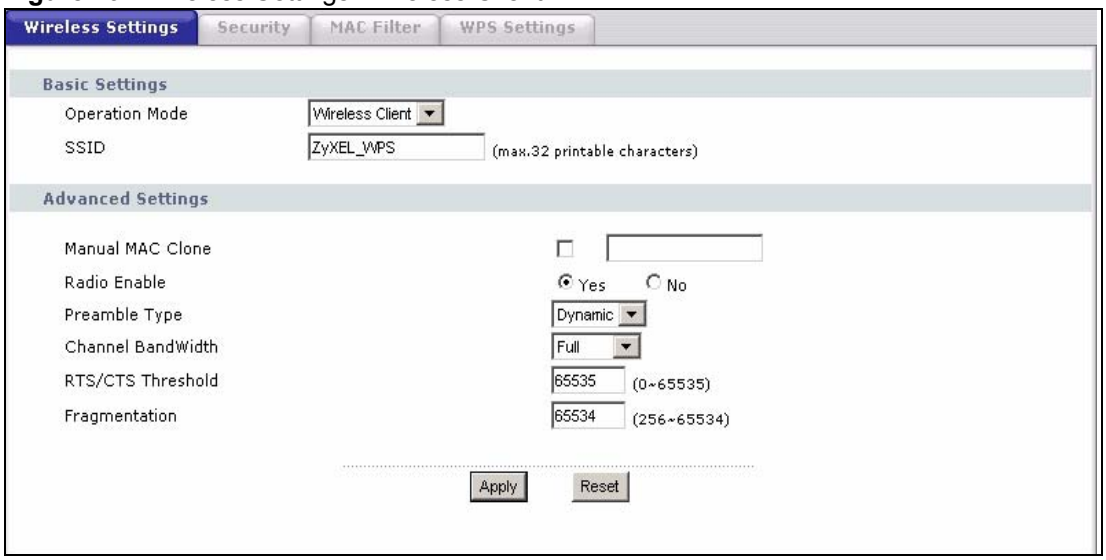
LABEL	DESCRIPTION
RTS/CTS Threshold	**RTS/CTS** is designed to prevent collisions due to hidden nodes. You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake. Enter a value between 0 and 65535. Data with a frame size larger than this value will perform the RTS/CTS handshake. If the **RTS/CTS** value is greater than the **Fragmentation** value, then the RTS/CTS handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size. See Appendix C on page 125 for more information.
Fragmentation	Enter a value between 256 and 65534. It is the maximum data fragment size that can be sent. A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference. See Appendix C on page 125 for more information.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.4.2 Wireless Client Mode

Select **Wireless Client** in the **Operation Mode** field to display the screen as shown next. This mode has the device act as wireless client to connect to a wireless network.

WPA, WPA2 and IEEE 802.1x wireless security are not available when you use Wireless Client, Bridge or AP+Repeater mode.

Figure 29 Wireless Settings: Wireless Client



The following table describes the labels in this screen.

Table 14 Wireless Settings: Wireless Client

LABEL	DESCRIPTION
Basic Settings	
Operation Mode	Select the operating mode from the drop-down list. The options are **Access Point**, **Wireless Client**, **Bridge** and **AP+Repeater**.
SSID	Wireless stations associating to the access point (AP) must have the same SSID. Enter a descriptive name (up to 32 printable characters) for the wireless LAN. Spaces are allowed. Note: If you are configuring the device from a computer connected to the wireless LAN and you change the device's SSID, channel or security settings, you will lose your wireless connection when you click **Apply** to save your settings. You must then change the wireless settings of your computer to match the device's new settings.
Advanced Settings	
Manual MAC Cloning	Every Ethernet-capable device is issued with a unique Media Access Control (MAC) address at the factory. This address is used to identify the device across a network. Your NWA570N is capable of “cloning”, or emulating, the MAC addresses of one or more other devices. Select the check box and enter the MAC address you want to clone.
Radio Enable	Turn on the wireless adapter to allow wireless communications between the device and other IEEE 802.11b and IEEE 802.11g compliant wireless devices. Turn off the wireless adapter to stop wireless communications between the device and other IEEE 802.11b and IEEE 802.11g compliant wireless devices.
Preamble Type	Preamble is used to signal that data is coming to the receiver. Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b compliant wireless adapters support long preamble, but not all support short preamble. Select **Long** preamble if you are unsure what preamble mode the wireless adapters support, and to provide more reliable communications in busy wireless networks. Select **Dynamic** to have the device automatically use short preamble when all wireless clients support it, otherwise the device uses long preamble. Note: The device and the wireless stations MUST use the same preamble mode in order to communicate.
RTS/CTS Threshold	**RTS/CTS** is designed to prevent collisions due to hidden nodes. You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake. Enter a value between 0 and 65535. Data with a frame size larger than this value will perform the RTS/CTS handshake. If the **RTS/CTS** value is greater than the **Fragmentation** value, then the RTS/CTS handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size. See Appendix C on page 125 for more information.

Table 14 Wireless Settings: Wireless Client (continued)

LABEL	DESCRIPTION
Fragmentation	Enter a value between 256 and 65534. It is the maximum data fragment size that can be sent. A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference. See Appendix C on page 125 for more information.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.4.3 Bridge Mode

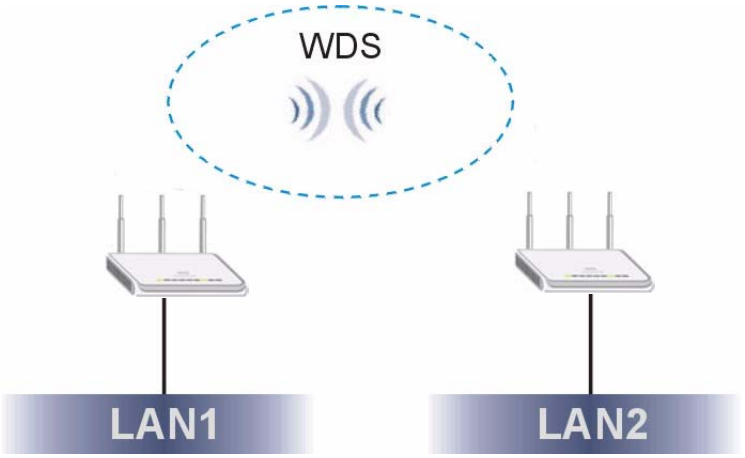
The device can act as a wireless network bridge and establish wireless links with other APs. You need to know the MAC address of the peer device, which also must be in bridge mode.

When two devices connect in **Bridge** mode, they form a WDS (Wireless Distribution System) allowing the computers in one LAN to connect to the computers in another LAN. See the following example.

WPA, WPA2 and IEEE 802.1x wireless security are not available when you use Wireless Client, Bridge or AP+Repeater mode.

You can use only WEP or WPA2-PSK keys to encrypt traffic between APs.

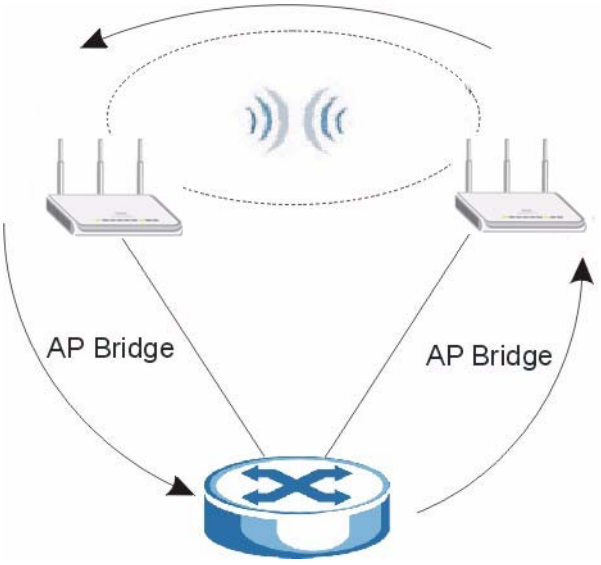
Figure 30 Bridging Example



Be careful to avoid bridge loops when you enable bridging in the NWA570N. Bridge loops cause broadcast traffic to circle the network endlessly, resulting in possible throughput degradation and disruption of communications. The following examples show two network topologies that can lead to this problem:

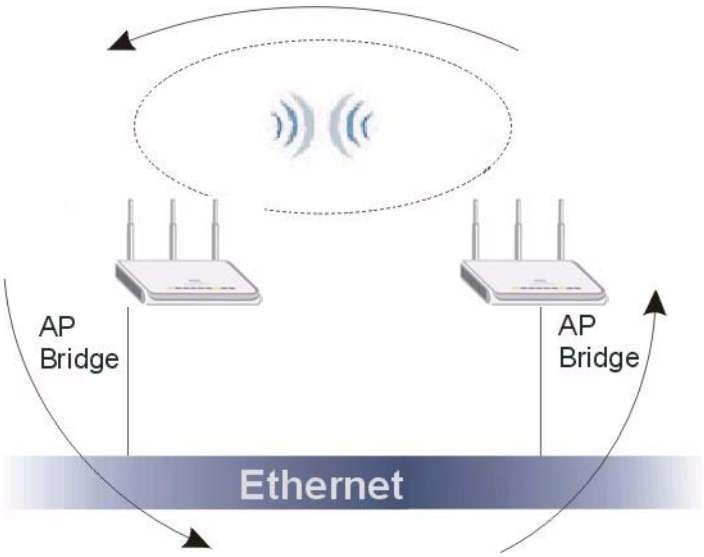
If two or more NWA570Ns (in bridge mode) are connected to the same hub as shown next.

Figure 31 Bridge Loop: Two Bridges Connected to Hub



If your NWA570N (in bridge mode) is connected to a wired LAN while communicating with another wireless bridge that is also connected to the same wired LAN as shown next.

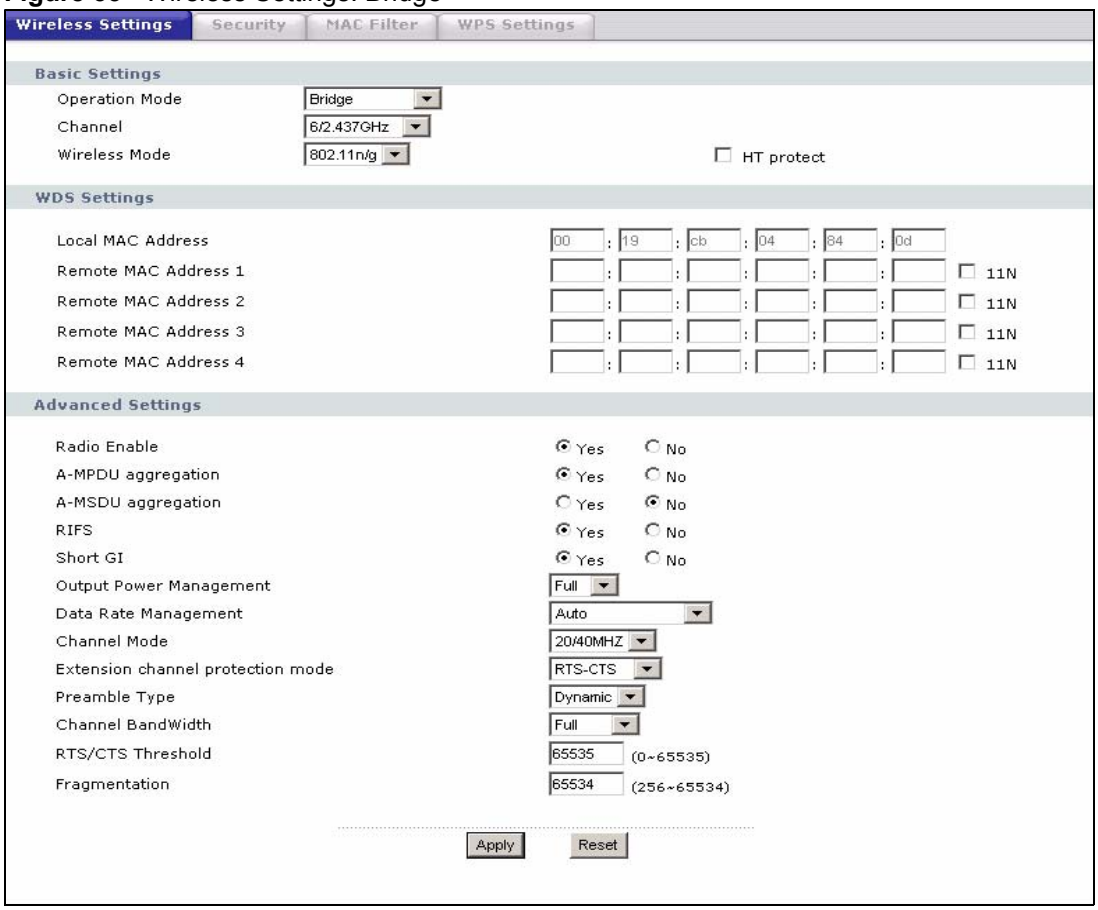
Figure 32 Bridge Loop: Bridge Connected to Wired LAN



To prevent bridge loops, ensure that your NWA570N is not set to bridge mode while connected to both wired and wireless segments of the same LAN.

Select **Bridge** as the **Operation Mode** to have the device act as a wireless bridge only.

Figure 33 Wireless Settings: Bridge



The following table describes the labels in this screen.

Table 15 Wireless Settings: Bridge

LABEL	DESCRIPTION
Basic Settings	
Operation Mode	Select the operating mode from the drop-down list. The options are **Access Point**, **Wireless Client**, **Bridge** and **AP+Repeater**. Note: If you are configuring the device from a computer connected to the wireless LAN and you change the device to use bridge mode, you will lose your wireless connection when you click **Apply** to save your settings. You must then connect to the device through the wired network.
Channel	The range of radio frequencies used by IEEE 802.11b/g wireless devices is called a channel. Select a wireless channel if interference from other nearby devices is a problem. The NWA570N and wireless devices in your network must use the same channel.
Wireless Mode	Select **802.11b/g** to allow IEEE 802.11b and IEEE 802.11g compliant WLAN devices to associate with the device. Select **802.11n/g** to allow IEEE 802.11n and IEEE 802.11g compliant WLAN devices to associate with the device.

Table 15 Wireless Settings: Bridge (continued)

LABEL	DESCRIPTION
HT protect	Select **HT protect** if you have devices on your wireless network that support IEEE 802.1b/g standards but not the IEEE 802.1n draft 2.0 standard. If all devices on your wireless network support IEEE 802.1n draft 2.0, deselect **HT protect** for higher data transmission rates.
WDS Settings	
Local MAC Address	This is the MAC address of the device.
Remote MAC Address 1~4	Type the MAC address of the peer device(s) (the other access point(s) in your network) in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.
Advanced Settings	
Radio Enable	Turn on the wireless adapter to allow wireless communications between the device and other IEEE 802.11b and IEEE 802.11g compliant wireless devices. Turn off the wireless adapter to stop wireless communications between the device and other IEEE 802.11b and IEEE 802.11g compliant wireless devices.
A-MPDU aggregation	Select **Yes** to enable the grouping of several A-MSDU (Aggregate MAC Service Data Units) into one large A-MPDU (Aggregate MAC Protocol Data Unit). When combined with **A-MSDU aggregation** this function allows faster data transfer rates.
A-MDSU aggregation	Select **Yes** to enable the grouping of small groups of data (MAC Service Data Units, or MSDU) into one large unit of MSDUs called an Aggregate MSDU (A-MSDU).
RIFS	Select **Yes** to enable **RIFS** (Reduced Interframe Spacing) and to increase data transfer rates.
Short GI	Select **Yes** or **No** to enable or disable **GI** (Guard Interval). The GI refers to the interval given between data transmission from users in order to reduce interference. Reducing the **GI** increases data transfer rates but also increases interference. Increasing the **GI** reduces data transfer rates but also reduces interference.
Output Power Management	Set the output power of the device in this field. If there is a high density of APs within an area, decrease the output power of the device to reduce interference with other APs. The options are **Full**, **50%**, **25%**, **12%** and **Min**.
Data Rate Management	Use this field to select a maximum data rate for the wireless connection(s). The options are **Auto**, **1** ~ **54M**, or **MCS0-7.2[15]** ~ **MCS15-144.4[300]**. Select **Auto** to let the NWA570N decide the most suitable data transfer rate. If you are not certain of what setting to choose, choose **Auto**. Alternatively select a data transfer rate from 1 to 54 Mbps. Please note that this is a total rate to be shared by all of the device's wireless connections. The NWA570N also lets you configure the maximum data transfer rate based on the IEEE802.1n draft 2.0 modulation and coding scheme (MCS). The MCS lists data transfer speeds given a set of network conditions. The "MCS0" in the **MCS0-7.2[15]** option refers to the first set of network conditions and so on. So **MCS0-7.2[15]** is appropriate for network conditions which provides data transfer rates of 7.2 Mbps and 15 Mbps at bandwidths of 20 Mhz and 40 Mhz respectively.

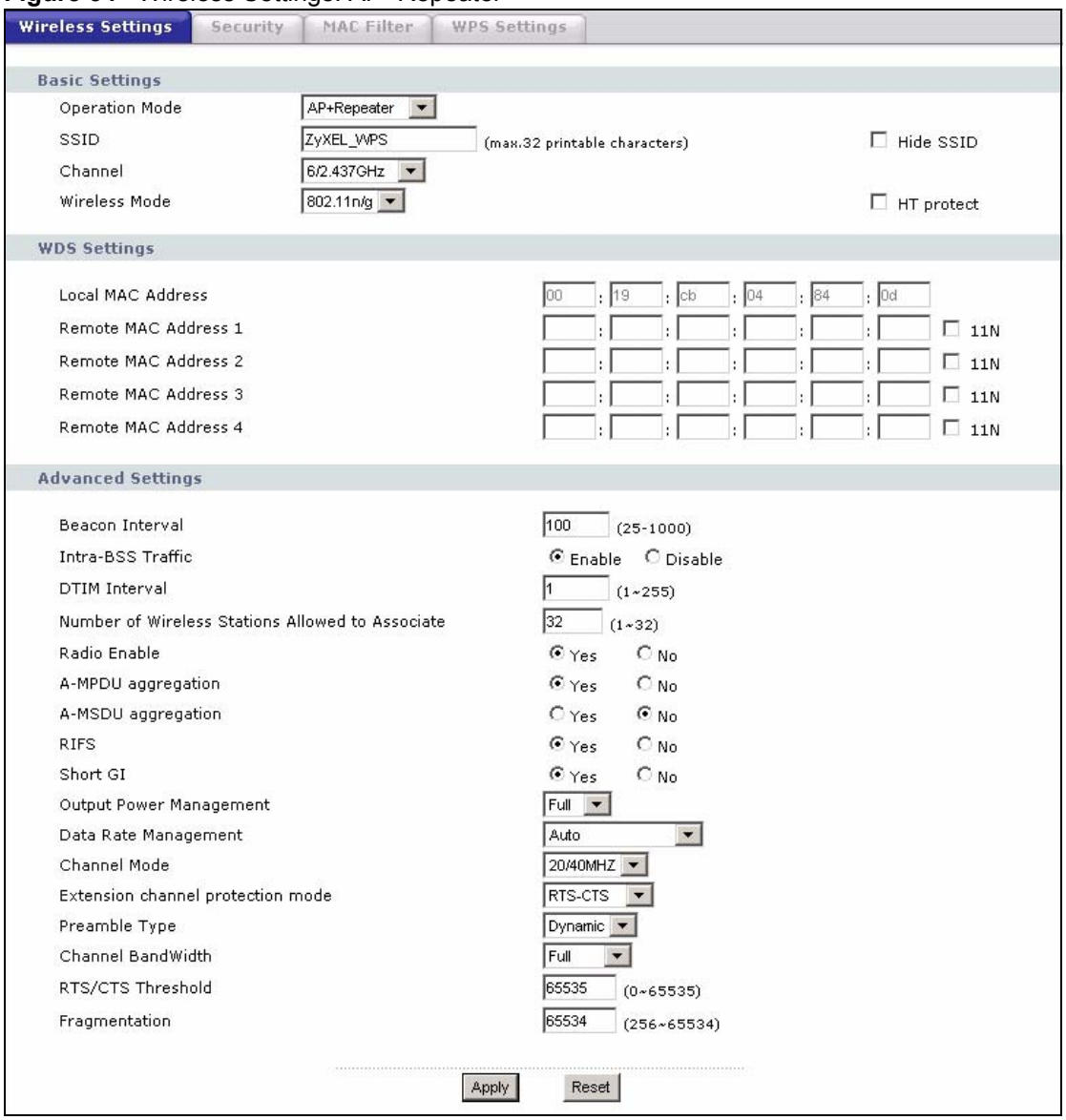
Table 15 Wireless Settings: Bridge (continued)

LABEL	DESCRIPTION
Preamble Type	Preamble is used to signal that data is coming to the receiver. Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b compliant wireless adapters support long preamble, but not all support short preamble. Select **Long** preamble if you are unsure what preamble mode the wireless adapters support, and to provide more reliable communications in busy wireless networks. Select **Dynamic** to have the device automatically use short preamble when all wireless clients support it, otherwise the device uses long preamble. Note: The device and the wireless stations MUST use the same preamble mode in order to communicate.
Channel Mode	Select whether the NWA570N uses a wireless channel bandwidth of 20 or 40 MHz. A standard 20MHz channel offers transfer speeds of up to 150Mbps whereas a 40MHz channel uses two standard channels and offers speeds of up to 300Mbps. However, not all devices support 40MHz channels. Select 20/49 MHz to allow the NWA570N to adjust the channel bandwidth depending on network conditions.
Extension channel protection mode	If you have only IEEE wireless 802.1n draft 2.0 compatible devices on your network, select **None**. If you have devices that are not compatible with IEEE wireless 802.1n draft 2.0 and you have selected a **Channel Mode** of 40 Mhz, select **CTS to self**. **CTS to self** and **RTS-CTS** are both kinds of protection mechanisms, similar to **HT protect**. Both decrease data transfer speeds but **CTS to self** is more efficient.
RTS/CTS Threshold	**RTS/CTS** is designed to prevent collisions due to hidden nodes. You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake. Enter a value between 0 and 65535. Data with a frame size larger than this value will perform the RTS/CTS handshake. If the **RTS/CTS** value is greater than the **Fragmentation** value, then the RTS/CTS handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size. See Appendix C on page 125 for more information.
Fragmentation	Enter a value between 256 and 65534. It is the maximum data fragment size that can be sent. A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference. See Appendix C on page 125 for more information.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.4.4 AP+Repeater Mode

Select **AP+Repeater** as the **Operation Mode** to have the device act as an access point and a wireless bridge.

Figure 34 Wireless Settings: AP+Repeater



The following table describes the labels in this screen.

Table 16 Wireless Settings: AP + Repeater

LABEL	DESCRIPTION
Basic Settings	
Operation Mode	Select the operating mode from the drop-down list. The options are **Access Point**, **Wireless Client**, **Bridge** and **AP+Repeater**.

Table 16 Wireless Settings: AP + Repeater (continued)

LABEL	DESCRIPTION
SSID	Wireless stations associating to the access point (AP) must have the same SSID. Enter a descriptive name (up to 32 printable characters) for the wireless LAN. Spaces are allowed. Note: If you are configuring the device from a computer connected to the wireless LAN and you change the device's SSID, channel or security settings, you will lose your wireless connection when you click **Apply** to save your settings. You must then change the wireless settings of your computer to match the device's new settings.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through passive scanning using a site survey tool.
Channel	The range of radio frequencies used by IEEE 802.11b/g wireless devices is called a channel. Select a wireless channel if interference from other nearby devices is a problem. The NWA570N and wireless devices in your network must use the same channel.
Wireless Mode	Select **802.11b/g** to allow IEEE 802.11b and IEEE 802.11g compliant WLAN devices to associate with the device. Select **802.11n/g** to allow IEEE 802.11n and IEEE 802.11g compliant WLAN devices to associate with the device.
HT protect	Select **HT protect** if you have devices on your wireless network that support IEEE 802.1b/g standards but not the IEEE 802.1n draft 2.0 standard. If all devices on your wireless network support IEEE 802.1n draft 2.0, deselect **HT protect** for higher data transmission rates.
WDS Settings	
Local MAC Address	This is the MAC address of the device.
Remote MAC Address 1~4	Type the MAC address of the peer device in a valid MAC address format, that is, six hexadecimal character pairs, for example, 12:34:56:78:9a:bc.
Advanced Settings	
Beacon Interval	Set the number of milliseconds that should pass between the sending out of beacons.
Intra-BSS Traffic	Intra-BSS traffic is traffic between wireless stations in the same BSS. Enable Intra-BSS traffic to allow wireless stations connected to the device to communicate with each other. Disable Intra-BSS traffic to only allow wireless stations to communicate with the wired network, not with each other.
DTIM Interval	Set the interval for wireless clients in sleep mode to wake up and check for multicast or broadcast traffic. The AP includes a Delivery Traffic Indication Message (DTIM) in the beacon to notify wireless clients in sleep mode that there is a multicast or broadcast packet awaiting delivery. The interval is a multiple of the beacon interval. For example, if the beacon interval is 100 milliseconds and the DTIM interval is 2, the AP includes a DTIM with every second beacon (or every 200 milliseconds).
Number of Wireless Stations Allowed to Associate:	Use this field to set a maximum number of wireless stations that may connect to the device. Enter the number (from 1 to 32) of wireless stations allowed.

Table 16 Wireless Settings: AP + Repeater (continued)

LABEL	DESCRIPTION
Radio Enable	Turn on the wireless adapter to allow wireless communications between the device and other IEEE 802.11b and IEEE 802.11g compliant wireless devices. Turn off the wireless adapter to stop wireless communications between the device and other IEEE 802.11b and IEEE 802.11g compliant wireless devices.
A-MPDU aggregation	Select **Yes** to enable the grouping of several A-MSDU (Aggregate MAC Service Data Units) into one large A-MPDU (Aggregate MAC Protocol Data Unit). When combined with **A-MSDU aggregation** this function allows faster data transfer rates.
A-MSDU aggregation	Select **Yes** to enable the grouping of small groups of data (MAC Service Data Units, or MSDU) into one large unit of MSDUs called an Aggregate MSDU (A-MSDU).
RIFS	Select **Yes** to enable **RIFS** (Reduced Interframe Spacing) and to increase data transfer rates.
Short GI	Select **Yes** or **No** to enable or disable **GI** (Guard Interval). The GI refers to the interval given between data transmission from users in order to reduce interference. Reducing the **GI** increases data transfer rates but also increases interference. Increasing the **GI** reduces data transfer rates but also reduces interference.
Output Power Management	Set the output power of the device in this field. If there is a high density of APs within an area, decrease the device's output power to reduce interference with other APs. The options are **Full**, **50%**, **25%**, **12%** and **Min**.
Data Rate Management	Use this field to select a maximum data rate for the wireless connection(s). Please note that this is a total rate to be shared by all of the device's wireless connections.
Channel Mode	Select whether the NWA570N uses a wireless channel bandwidth of 20 or 40 MHz. A standard 20MHz channel offers transfer speeds of up to 150Mbps whereas a 40MHz channel uses two standard channels and offers speeds of up to 300Mbps. However, not all devices support 40MHz channels. Select 20/49 MHz to allow the NWA570N to adjust the channel bandwidth depending on network conditions.
Extension channel protection mode	If you have only IEEE wireless 802.1n draft 2.0 compatible devices on your network, select **None**. If you have devices that are not compatible with IEEE wireless 802.1n draft 2.0 and you have selected a **Channel Mode** of 40 Mhz, select **CTS to self**. **CTS to self** and **RTS-CTS** are both kinds of protection mechanisms, similar to **HT protect**. Both decrease data transfer speeds but **CTS to self** is more efficient.
Preamble Type	Preamble is used to signal that data is coming to the receiver. Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b compliant wireless adapters support long preamble, but not all support short preamble. Select **Long** preamble if you are unsure what preamble mode the wireless adapters support, and to provide more reliable communications in busy wireless networks. Select **Dynamic** to have the device automatically use short preamble when all wireless clients support it, otherwise the device uses long preamble. Note: The device and the wireless stations MUST use the same preamble mode in order to communicate.

Table 16 Wireless Settings: AP + Repeater (continued)

LABEL	DESCRIPTION
RTS/CTS Threshold	**RTS/CTS** is designed to prevent collisions due to hidden nodes. You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake. Enter a value between 0 and 65535. Data with a frame size larger than this value will perform the RTS/CTS handshake. If the **RTS/CTS** value is greater than the **Fragmentation** value, then the RTS/CTS handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size. See Appendix C on page 125 for more information.
Fragmentation	Enter a value between 256 and 65534. It is the maximum data fragment size that can be sent. A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference. See Appendix C on page 125 for more information.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.5 Configuring Wireless Security

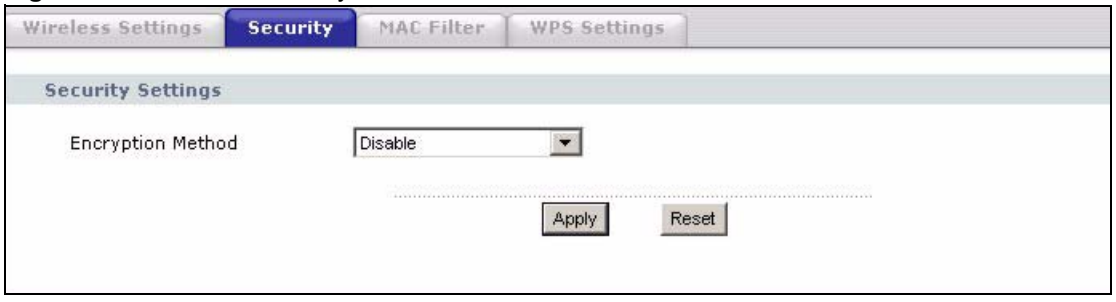
Click **Wireless** > **Security** to display the **Security** screen. This screen varies according to the encryption method you select.

The encryption methods available depend on the **Operation Mode** you select in the **Wireless** > **Wireless** screen.

6.5.1 Wireless Security: Disable

If you do not enable any wireless security on your device, your network is accessible to any wireless networking device that is within range.

Figure 35 Wireless Security: Disable



The following table describes the labels in this screen.

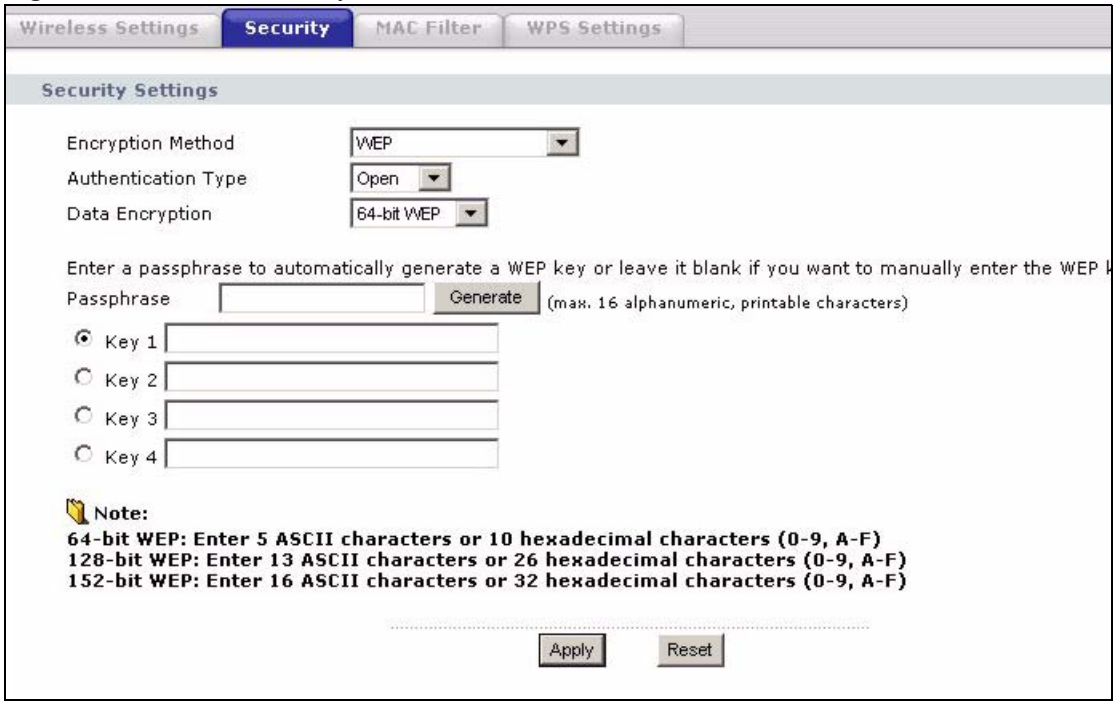
Table 17 Wireless Security: Disable

LABEL	DESCRIPTION
Encryption Method	Select **Disable** to have no wireless LAN security configured.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.5.2 Wireless Security: WEP

WEP provides a mechanism for encrypting data using encryption keys. Both the AP and the wireless stations must use the same WEP key to encrypt and decrypt data. You can configure up to four 64-bit, 128-bit or 152-bit WEP keys, but only one key can be used at any one time.

Figure 36 Wireless Security: WEP



The following table describes the labels in this screen.

Table 18 Wireless Security: WEP

LABEL	DESCRIPTION
Encryption Method	Select **WEP** if you want to configure WEP encryption parameters.
Authentication Type	Select **Auto**, **Open** or **Shared** from the drop-down list box.
WEP Encryption	Select **64 bit WEP**, **128 bit WEP** or **152 bit WEP** to enable data encryption.
Passphrase	If you selected 64-bit or 128-bit WEP, you can enter a “passphrase” (password phrase) of up to 32 case-sensitive printable characters and click **Generate** to have the device create four different WEP keys.

Table 18 Wireless Security: WEP

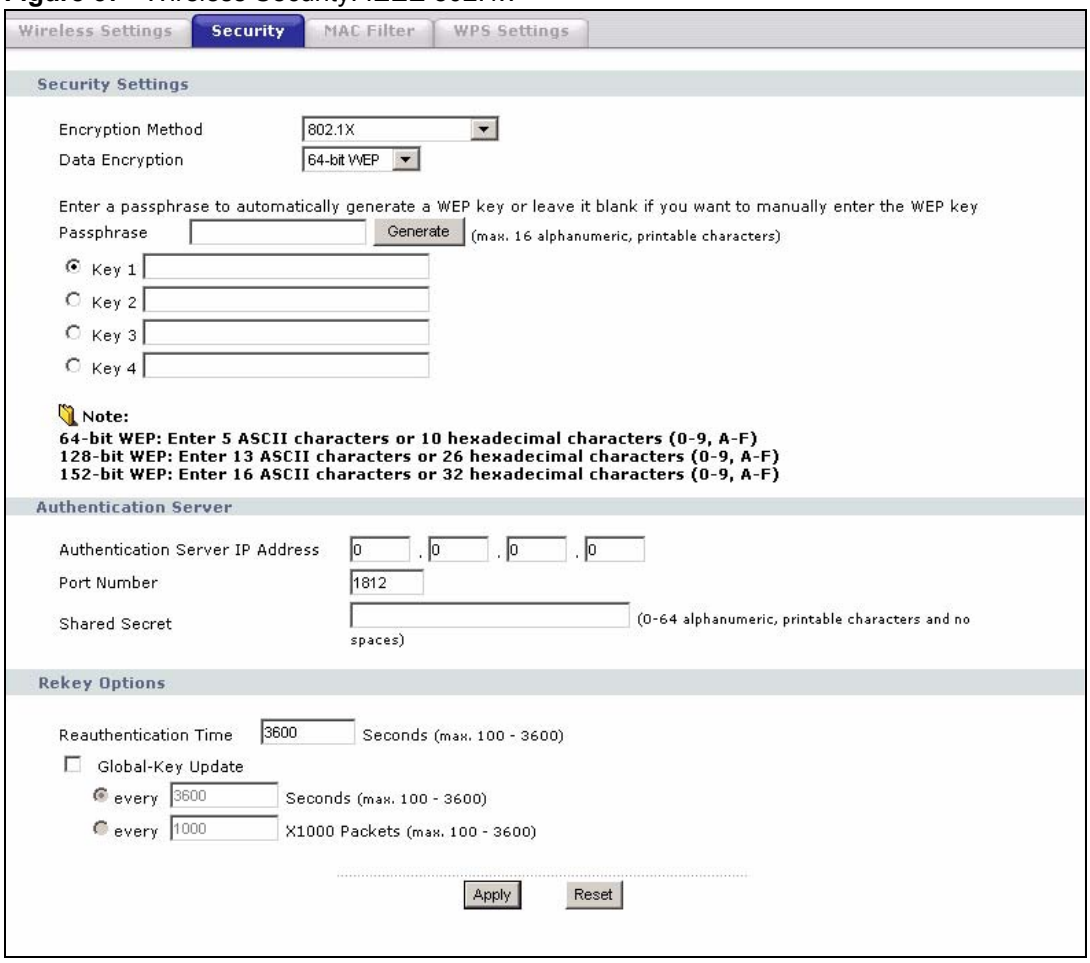
LABEL	DESCRIPTION
Generate	After you enter the passphrase, click **Generate** to have the device generates four different WEP keys automatically.
Key 1 to Key 4	If you want to manually set the WEP keys, enter the WEP key in the field provided. Select a WEP key to use for data encryption. The WEP keys are used to encrypt data. Both the device and the wireless stations must use the same WEP key for data transmission. If you chose **64 bit WEP**, then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F"). If you chose **128 bit WEP**, then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F"). If you chose **152 bit WEP**, then enter 16 ASCII characters or 32 hexadecimal characters ("0-9", "A-F").
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.5.3 Wireless Security: IEEE 802.1x

The IEEE 802.1x standard outlines enhanced security methods for both the authentication of wireless stations and encryption key management.

Once you enable user authentication, you need to specify an external RADIUS server on the device for authentication.

Figure 37 Wireless Security: IEEE 802.1x



The following table describes the labels in this screen.

Table 19 Wireless Security: IEEE 802.1x

LABEL	DESCRIPTION
Encryption Method	Select **802.1X** to configure authentication of wireless stations and encryption key management. Note: WPA, WPA2 and IEEE 802.1x wireless security are not available when you use Bridge or AP+Repeater mode. You can only use WEP keys to encrypt traffic between APs.
Data Encryption	Select **None** to allow wireless stations to communicate with the access points without using dynamic WEP key exchange. Select **64 bits WEP**, **128 bits WEP** or **152 bits WEP** to enable data encryption. Up to 32 stations can access the device when you configure dynamic WEP key exchange.
Passphrase	If you selected 64-bit or 128-bit WEP, you can enter a “passphrase” (password phrase) of up to 32 case-sensitive printable characters and click **Generate** to have the device create four different WEP keys.

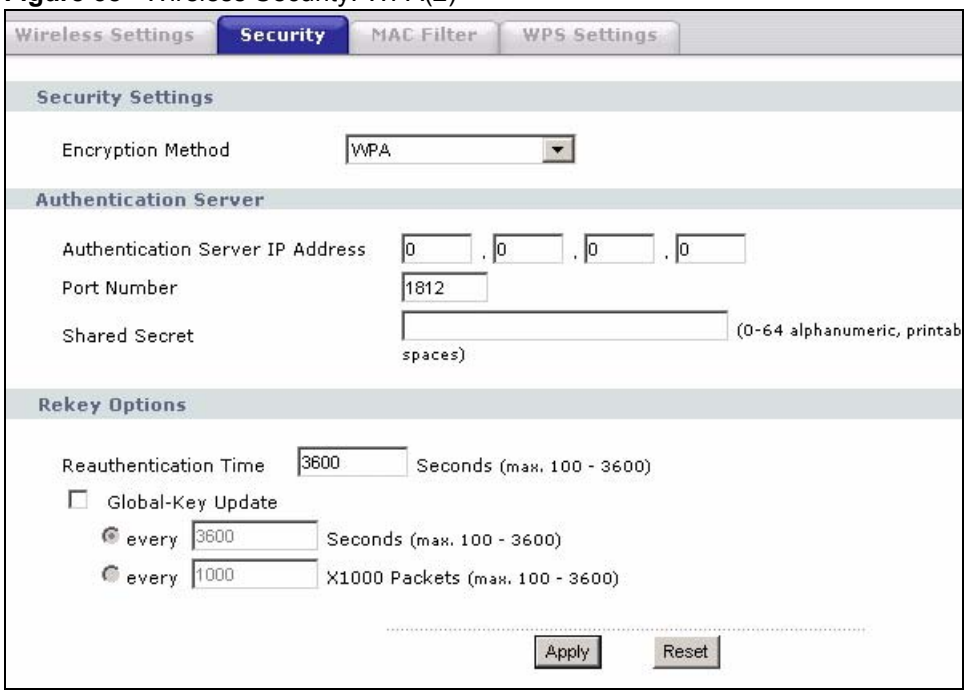
Table 19 Wireless Security: IEEE 802.1x

LABEL	DESCRIPTION
Key 1 to Key 4	If you want to manually set the WEP keys, enter the WEP key in the field provided. Select a WEP key to use for data encryption. The WEP keys are used to encrypt data. Both the device and the wireless stations must use the same WEP key for data transmission. If you chose **64 bit WEP**, then enter any 5 ASCII characters or 10 hexadecimal characters ("0-9", "A-F"). If you chose **128 bit WEP**, then enter 13 ASCII characters or 26 hexadecimal characters ("0-9", "A-F"). If you chose **152 bit WEP**, then enter 16 ASCII characters or 32 hexadecimal characters ("0-9", "A-F").
Authentication Server IP Address	Enter the IP address of the external authentication server in dotted decimal notation.
Port Number	Enter the port number of the external authentication server. The default port number is 1812. You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	Enter a password (up to 63 printable characters) as the key to be shared between the external authentication server and the device. The key must be the same on the external authentication server and your device. The key is not sent over the network.
Reauthentication Time	Specify how often wireless stations have to resend user names and passwords in order to stay connected. Enter a time interval between 100 and 3600 seconds. If wireless station authentication is done using a RADIUS server, the reauthentication timer on the RADIUS server has priority.
Global-Key Update	This is how often the AP sends a new group key out to all clients. The re-keying process is the WPA equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis. Specify an interval either in seconds or thousands of packets that the device sends.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.5.4 Wireless Security: WPA(2)

WPA (Wi-Fi Protected Access) is a subset of the IEEE 802.11i standard. WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA. Key differences between WPA(2) and WEP are user authentication and improved data encryption.

Figure 38 Wireless Security: WPA(2)



The following table describes the labels in this screen.

Table 20 Wireless Security: WPA(2)

LABEL	DESCRIPTION
Encryption Method	Select **WPA**, **WPA2** or **WPA & WPA2** to configure user authentication and improved data encryption. Note: WPA, WPA2 and IEEE 802.1x wireless security are not available when you use Wireless Client, Bridge or AP+Repeater mode. Note: You can only use WEP keys to encrypt traffic between APs.
Authentication Server IP Address	Enter the IP address of the external authentication server in dotted decimal notation.
Port Number	Enter the port number of the external authentication server. The default port number is 1812. You need not change this value unless your network administrator instructs you to do so with additional information.
Shared Secret	Enter a password (up to 63 printable characters) as the key to be shared between the external authentication server and the device. The key must be the same on the external authentication server and your device. The key is not sent over the network.
Reauthentication Time	Specify how often wireless stations have to resend user names and passwords in order to stay connected. Enter a time interval between 100 and 3600 seconds. If wireless station authentication is done using a RADIUS server, the reauthentication timer on the RADIUS server has priority.
Global-Key Update	This is how often the AP sends a new group key out to all clients. The re-keying process is the WPA equivalent of automatically changing the WEP key for an AP and all stations in a WLAN on a periodic basis. Specify an interval either in seconds or thousands of packets that the device sends.

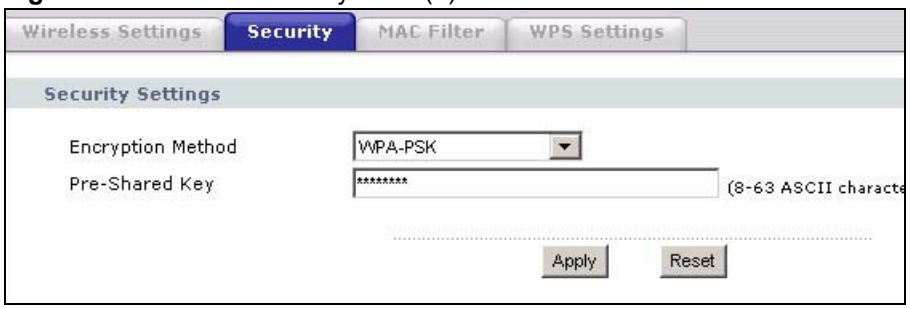
Table 20 Wireless Security: WPA(2) (continued)

LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.5.5 Wireless Security: WPA(2)-PSK

Select **WPA-PSK**, **WPA2-PSK** or **WPA-PSK & WPA2-PSK** in the **Encryption Method** drop down list-box to display the screen displays as next.

Figure 39 Wireless Security: WPA(2)-PSK



The following table describes the labels in this screen.

Table 21 Wireless Security: WPA-PSK

LABEL	DESCRIPTION
Encryption Method	Select **WPA-PSK**, **WPA2-PSK** or **WPA-PSK & WPA2-PSK** if you want to configure a pre-shared key. Choose this option only if your wireless clients support it.
Pre-Shared Key	The encryption mechanisms used for WPA and WPA-PSK are the same. The only difference between the two is that WPA-PSK uses a simple common password, instead of user-specific credentials. Type a pre-shared key from 8 to 63 ASCII characters (including spaces and symbols). This field is case-sensitive.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

6.6 MAC Filter

The MAC filter screen allows you to give exclusive access to up to 32 devices (Allow Association) or exclude up to 32 devices from accessing the device (Deny Association). Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC addresses of the devices to configure this screen.

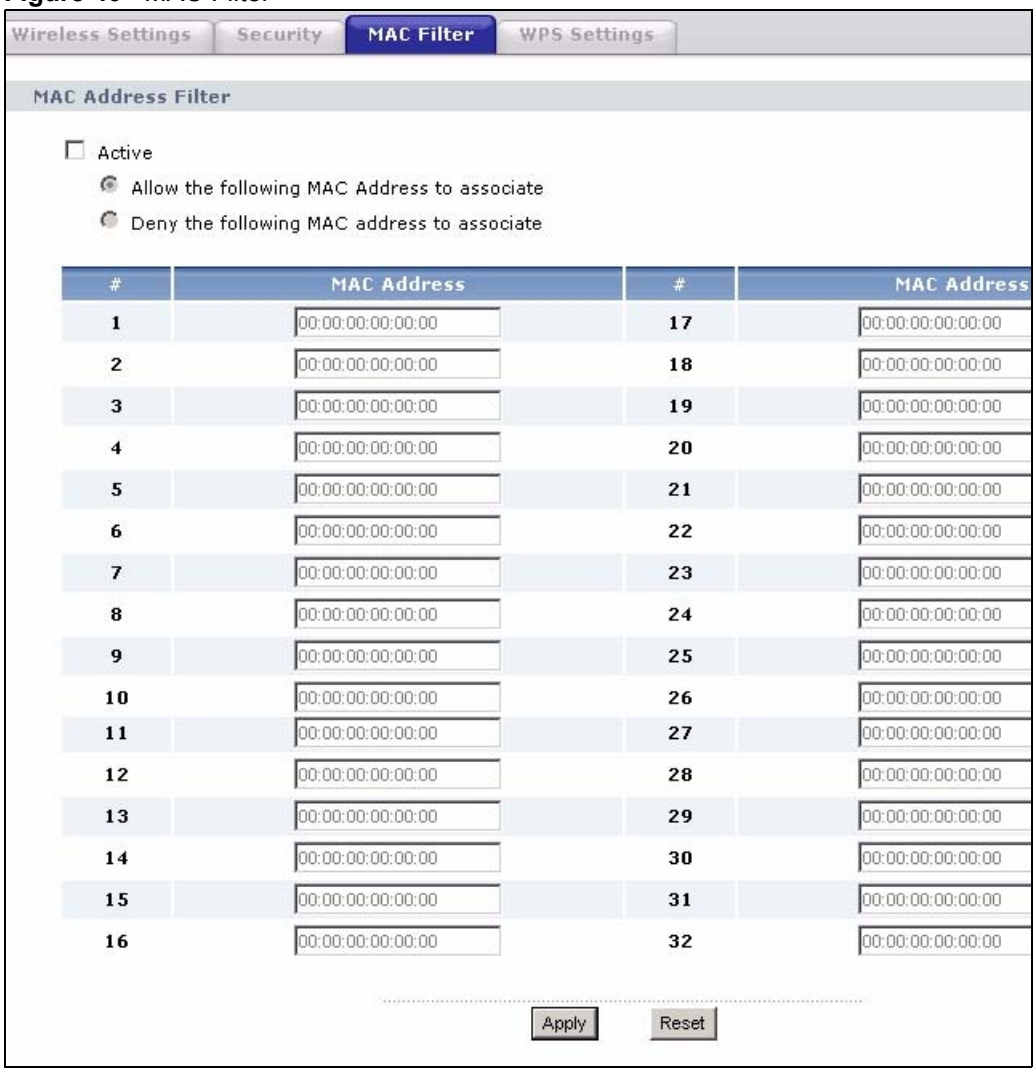
The MAC filter works when the device functions as an AP. It allows or denies wireless client access. The MAC filter does not apply to bridge or repeater functions.

The following applies if you set the device to client mode and want to connect to an AP that uses a MAC filter. After the device turns on in client mode, it clones the MAC address of the first packets that it receives from devices connected to the Ethernet port. It uses this MAC address on the packets that it sends to an AP. All of the packets that the device sends to an AP will appear to be from the first device that connected to the Ethernet port. If you turn the device off and back on, it again clones the MAC address of the first packets that it receives from devices connected to the Ethernet port. You may be able to check the association list on the AP to determine which MAC address the device is currently using.

To change your device's MAC filter settings, click **Wireless > MAC Filter**. The screen appears as shown.

Be careful not to list your computer's MAC address and select **Deny the following MAC address to associate** when managing the device via a wireless connection. This would lock you out.

Figure 40 MAC Filter



The following table describes the labels in this screen.

Table 22 MAC Filter

LABEL	DESCRIPTION
Active	Select the check box to enable MAC address filtering and define the filter action for the list of MAC addresses in the MAC address filter table. Select **Allow the following MAC address to associate** to permit access to the device. MAC addresses not listed will be denied access to the device. Select **Deny the following MAC address to associate** to block access to the device. MAC addresses not listed will be allowed to access the device.
#	This is the index number of the MAC address.
MAC Address	Enter the MAC addresses (in XX:XX:XX:XX:XX:XX format) of the wireless station that are allowed or denied access to the device in these address fields.
Apply	Click **Apply** to save your changes back to the device.
Reset	Click **Reset** to begin configuring this screen afresh.

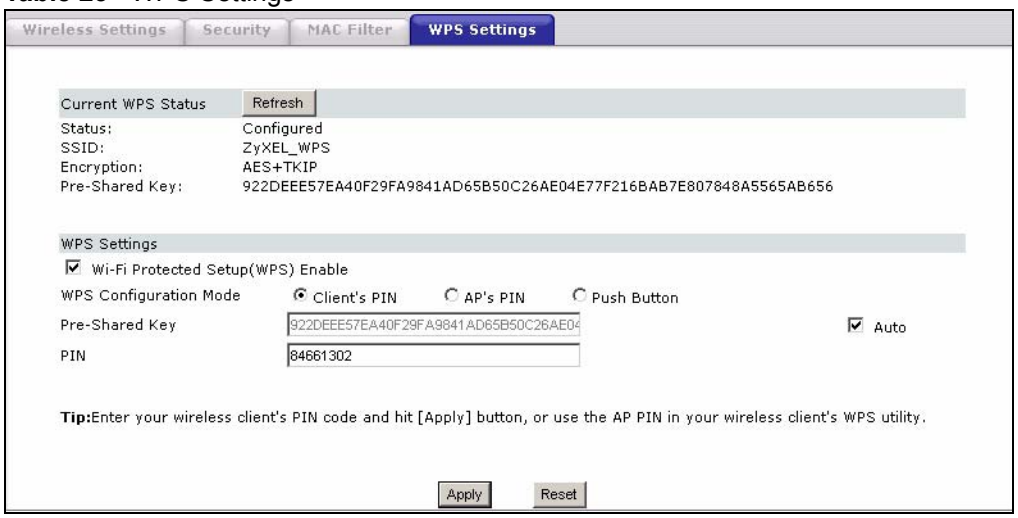
6.7 WPS Settings

WiFi Protected Setup (WPS) allows you to quickly set up a secure network with other WPS enabled devices, much more easily than manually configuring wireless connections and security through a web configurator.

Your NWA570N uses WPS to set up a secure connection with other WPS enabled wireless devices in two ways. The first method uses a push-button, either physically located on the housing of the wireless devices, or provided as a feature in the device's software. The second method relies on the exchanging of PINs (Personal Identification Numbers) between wireless devices. Both methods use the WPA(2) security standard, which uses a pre-shared key to encrypt network traffic.

Click **Network** > **WPS**. The following screen displays. Use this screen to configure WPS on your NWA570N.

Table 23 WPS Settings



The following table describes the labels in the screen.

Table 24 WPS Settings

LABEL	DESCRIPTION
Current WPS Status	
Refresh	Click this button to have the device renew the information on this screen.
WPS Settings	
Wi-Fi Protected Setup (WPS) Enable	Select this to enable WPS on your NWA570N.
WPS Configuration Mode	You can set up a WPS connection with another WPS enabled device in three ways. Select **Client's PIN** to set up WPS using the PIN generated by the WPS menu on the client device. Select **AP's PIN** to set up WPS using the PIN generated by the WPS menu on the AP. Select **Push Button** to set up WPS using either a physical button on the device's casing, or a menu button similar to the **Start PBC** button on this screen.

Table 24 WPS Settings

LABEL	DESCRIPTION
Pre-Shared Key	The field displays if **Push Button** or **Client's PIN** is selected. This displays the pre-shared key used for encrypting the data on your network. If **Auto** is selected, this field is read-only. If **Auto** is not selected you can type a pre-shared key from 8 to 63 keyboard characters (including spaces and symbols). This field is case-sensitive.
PIN	The PIN field shows when **Client's PIN** or **AP's PIN** is selected. When **Client's PIN** is selected, enter the PIN generated on the client device in the **PIN** field. When **AP's PIN** is selected, the **PIN** field is read-only. Enter this PIN in the appropriate field on your client device.
Auto	Select **Auto** to have the NWA570N generate a pre-shared key.
Start PBC	If you have selected **Push Button**, click this button to start the WPS connection procedure. You have two minutes to press the button on the device you wish to connect with. This button may be either a physical button on the outside of the device, or a menu button similar to the **Start PBC** button on this screen.
Reset	Click **Reset** to begin configuring this screen afresh.

Follow these steps to set up a WPS connection using a PIN.

1. Ensure **Wi-Fi Protected Setup (WPS) Enable** is selected.
2. Select **Auto** to generate a pre-shared key, or type a pre-shared key in the **Pre-Shared Key** field.
3. Select **Client's PIN** or **AP's PIN**.

- If you select **Client's PIN**, type the PIN generated on the device you want to add to the network and click **Apply**.
- If you select **AP's PIN**, type the PIN in the **PIN** field into the appropriate field on the device you want to add to your network and click **Apply**.

Follow these steps to set up a WPS connection using the push-button.

1. Ensure **Wi-Fi Protected Setup (WPS) Enable** is selected.
2. Select **Auto** to generate a pre-shared key, or type a pre-shared key in the **Pre-Shared Key** field.
3. Select **Push-Button**.
4. Click **Start PBC** or click the **WPS** button located on the NWA570N's housing.
5. You have two minutes to press the WPS button on the device you wish to connect with. This button may be either a physical button on the outside of the device, or a menu button similar to the **Start PBC** button on this screen.

7

Management Screens

This chapter describes the Maintenance screens.

7.1 Maintenance Overview

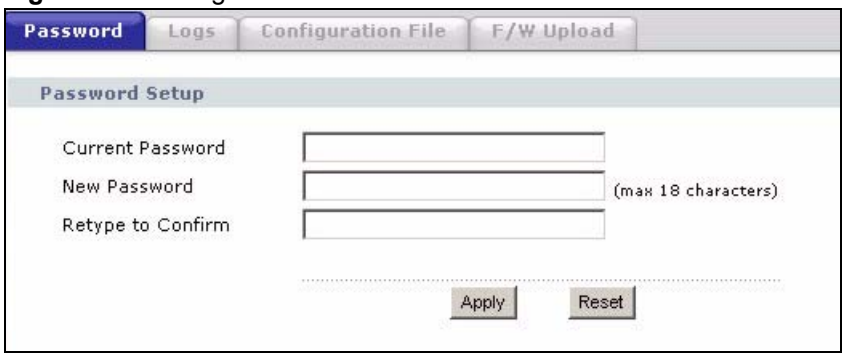
Use these maintenance screens to change the password, view logs, back up or restore the ZyXEL Device's configuration and change the web configurator language.

7.2 Password

To change your device's password (recommended), click **Management**. The screen appears as shown. This screen allows you to change the device's password.

If you forget your password (or the device IP address), you will need to reset the device. See the section on resetting the device for details.

Figure 41 Management: Password



The following table describes the labels in this screen.

Table 25 Management: Password

LABEL	DESCRIPTION
Current Password	Type in your existing system password (1234 is the default password).
New Password	Type your new system password (up to 30 printable characters). Spaces are not allowed. Note that as you type a password, the screen displays an asterisk (*) for each character you type.
Retype to Confirm	Retype your new system password for confirmation.

Table 25 Management: Password (continued)

LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes back to the device.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

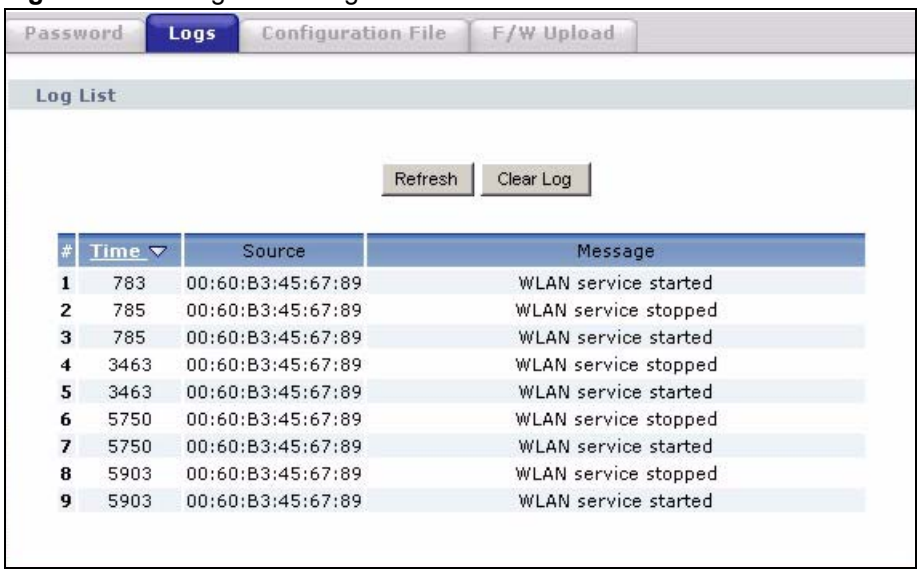
7.3 Logs

Click **Management > Logs** to open the **Logs** screen.

You can view logs and alert messages in this screen. Once the log table is full, old logs are deleted as new logs are created.

Click a column heading to sort the entries. A triangle indicates the direction of the sort order.

Figure 42 Management: Logs


Password
Logs
Configuration File
F/W Upload
Log List
Refresh
Clear Log
Time Source Message
1 783 00:60:B3:45:67:89 WLAN service started
2 785 00:60:B3:45:67:89 WLAN service stopped
3 785 00:60:B3:45:67:89 WLAN service started
4 3463 00:60:B3:45:67:89 WLAN service stopped
5 3463 00:60:B3:45:67:89 WLAN service started
6 5750 00:60:B3:45:67:89 WLAN service stopped
7 5750 00:60:B3:45:67:89 WLAN service started
8 5903 00:60:B3:45:67:89 WLAN service stopped
9 5903 00:60:B3:45:67:89 WLAN service started

The following table describes the labels in this screen.

Table 26 Management: Logs

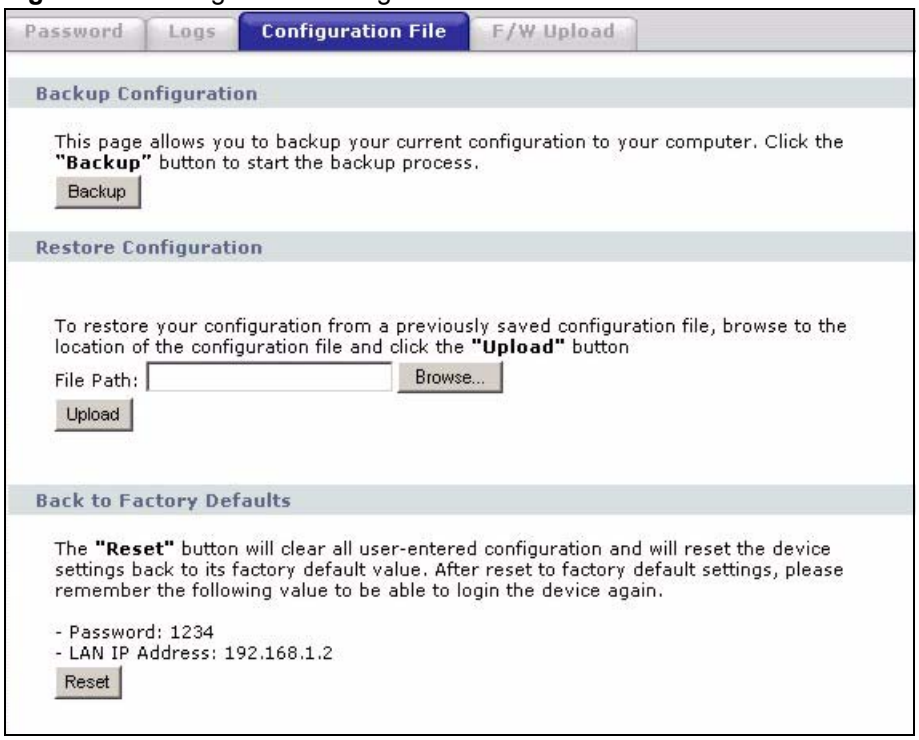
LABEL	DESCRIPTION
Display	Select a category of logs to view.
Refresh	Click **Refresh** to renew the log screen.
Clear Log	Click **Clear Log** to clear all the logs.
#	This is the log's index number.
Time	This field displays the time the log was recorded. It is the number of seconds since the last time the system turned on.
Message	This field states the reason for the log.
Source	This field lists the source IP address and the port number of the incoming packet that caused the log.
Destination	This field lists the destination IP address and the port number of the outgoing packet that caused the log.
Note	This field displays additional information about the log entry.

7.4 Configuration File

The configuration file (often called the romfile or rom-0) contains the factory default settings such as password and TCP/IP Setup, etc. It arrives from ZyXEL with a .rom filename extension. Once you have customized the device's settings, they can be saved back to your computer under a filename of your choosing.

Click **Management > Configuration File**. Information related to factory defaults, backup configuration, and restoring configuration appears as shown next.

Figure 43 Management: Configuration File


Password
Logs
Configuration File
F/W Upload
Backup Configuration
This page allows you to backup your current configuration to your computer. Click the "Backup" button to start the backup process.
Backup
Restore Configuration
To restore your configuration from a previously saved configuration file, browse to the location of the configuration file and click the "Upload" button
File Path:
Browse...
Upload
Back to Factory Defaults
The "Reset" button will clear all user-entered configuration and will reset the device settings back to its factory default value. After reset to factory default settings, please remember the following value to be able to login the device again.
- Password: 1234
- LAN IP Address: 192.168.1.2
Reset

7.4.1 Backup Configuration

Backup configuration allows you to back up (save) the device's current configuration to a file on your computer. Once your device is configured and functioning properly, it is highly recommended that you back up your configuration file before making configuration changes. The backup configuration file will be useful in case you need to return to your previous settings.

Click **Backup** to save the device's current configuration to your computer.

7.4.2 Restore Configuration

Restore configuration allows you to upload a new or previously saved configuration file from your computer to your device.

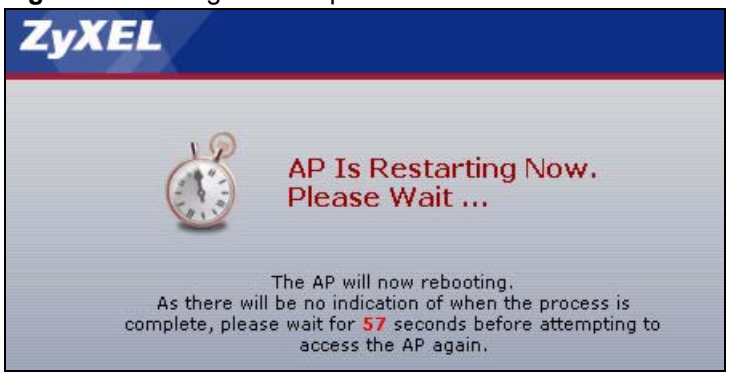
Table 27 Management: Configuration File: Restore Configuration

LABEL	DESCRIPTION
File Path	Type in the location of the file you want to upload in this field or click **Browse ...** to find it.
Browse...	Click **Browse...** to find the file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Upload	Click **Upload** to begin the upload process.

Do not turn off the device while configuration file upload is in progress.

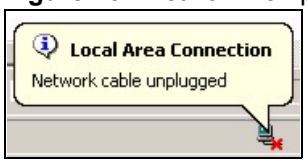
The following screen displays. You must wait one minute before logging into the device again.

Figure 44 Configuration Upload Successful


ZyXEL
AP Is Restarting Now.
Please Wait ...
The AP will now rebooting.
As there will be no indication of when the process is complete, please wait for 57 seconds before attempting to access the AP again.

The device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

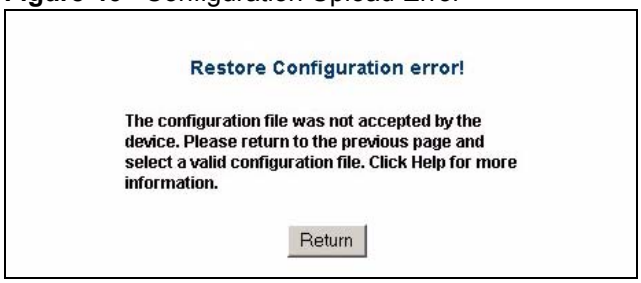
Figure 45 Network Temporarily Disconnected



If you uploaded the default configuration file you may need to change the IP address of your computer to be in the same subnet as that of the default device IP address (192.168.1.2).

If the upload was not successful, the following screen will appear. Click **Return** to go back to the Configuration File screen.

Figure 46 Configuration Upload Error


Restore Configuration error!
The configuration file was not accepted by the device. Please return to the previous page and select a valid configuration file. Click Help for more information.
Return

7.4.3 Back to Factory Defaults

Clicking the **RESET** button in this section clears all user-entered configuration information and returns the device to its factory defaults. The following warning screen will appear.

Figure 47 Reset Warning Message

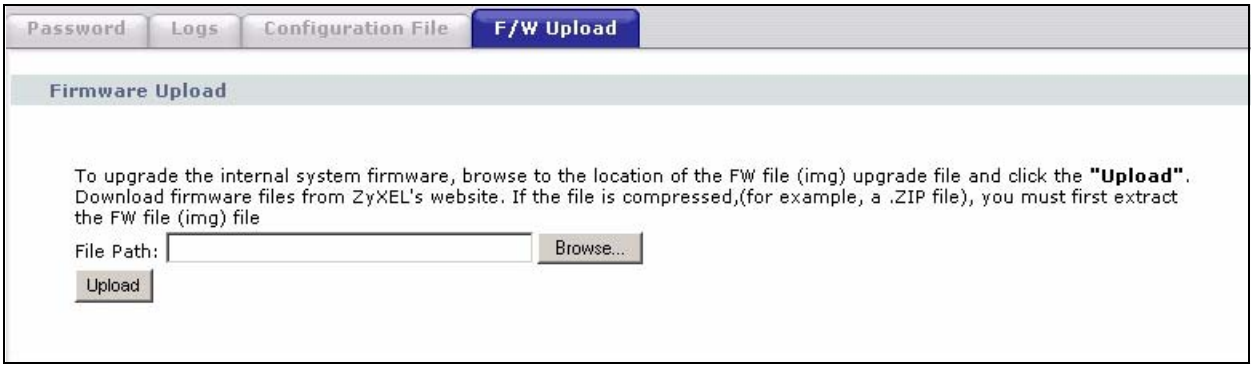
You can also press the **RESET** button on the rear panel to reset the factory defaults of your device. Refer to the section on resetting the device for more information on the **RESET** button.

7.5 F/W Upload Screen

Find firmware at www.zyxel.com in a file that (usually) uses the system model name with a .img extension, for example, "zyxel.img". The upload process uses HTTP (Hypertext Transfer Protocol) and may take up to two minutes. After a successful upload, the system will reboot.

Click **Management > F/W Upload** to display the screen as shown. Follow the instructions in this screen to upload firmware to your device.

Figure 48 Management: F/W Upload


Password
Logs
Configuration File
F/W Upload
Firmware Upload
To upgrade the internal system firmware, browse to the location of the FW file (img) upgrade file and click the "Upload". Download firmware files from ZyXEL's website. If the file is compressed,(for example, a .ZIP file), you must first extract the FW file (img) file
File Path:
Browse...
Upload

The following table describes the labels in this screen.

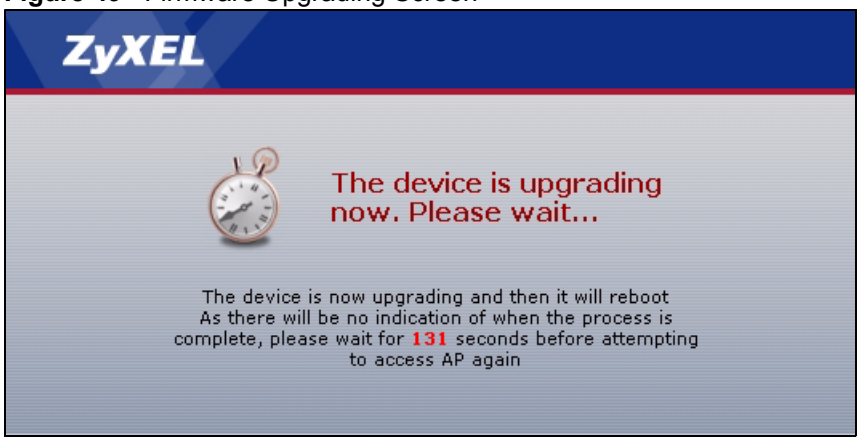
Table 28 Management: F/W Upload

LABEL	DESCRIPTION
File Path	Type in the location of the file you want to upload in this field or click **Browse ...** to find it.
Browse...	Click **Browse...** to find the .rmt file you want to upload. Remember that you must decompress compressed (.zip) files before you can upload them.
Upload	Click **Upload** to begin the upload process. This process may take up to two minutes.

Do not turn off the device while firmware upload is in progress!

The following screen appears. Wait two minutes before logging into the device again.

Figure 49 Firmware Upgrading Screen


ZyXEL
The device is upgrading now. Please wait...
The device is now upgrading and then it will reboot
As there will be no indication of when the process is complete, please wait for 131 seconds before attempting to access AP again

The device automatically restarts in this time causing a temporary network disconnect. In some operating systems, you may see the following icon on your desktop.

Figure 50 Network Temporarily Disconnected

After two minutes, log in again and check your new firmware version in the **System Status** screen.

If the upload was not successful, the following status message displays at the bottom of the screen.

Figure 51 Firmware Upload Error

PART III
Troubleshooting and Product Specifications

Troubleshooting (91)
Product Specifications and Wall-Mounting Instructions (95)

8

Troubleshooting

This chapter offers some suggestions to solve problems you might encounter. The potential problems are divided into the following categories.

- Power, Hardware Connections, and LEDs
- NWA570N Access and Login
- Internet Access

8.1 Power, Hardware Connections, and LEDs

The NWA570N does not turn on. None of the LEDs turn on.

1. Make sure you are using the power adaptor or cord included with the NWA570N.
2. Make sure the power adaptor or cord is connected to the NWA570N and plugged in to an appropriate power source. Make sure the power source is turned on.
3. Disconnect and re-connect the power adaptor or cord to the NWA570N.
4. If the problem continues, contact the vendor.

One of the LEDs does not behave as expected.

1. Make sure you understand the normal behavior of the LED. See Section 1.5 on page 28.
2. Check the hardware connections. See the Quick Start Guide.
3. Inspect your cables for damage. Contact the vendor to replace any damaged cables.
4. Disconnect and re-connect the power adaptor to the NWA570N.
5. If the problem continues, contact the vendor.

8.2 NWA570N Access and Login

I forgot the IP address for the NWA570N.

1. The default IP address is **192.168.1.2**.
2. If this does not work, you have to reset the device to its factory defaults. See Section 1.8 on page 30.

I forgot the password.

1. The default password is **1234**.
2. If this does not work, you have to reset the device to its factory defaults. See Section 1.8 on page 30.

I cannot see or access the **Login** screen in the web configurator.

1. Make sure you are using the correct IP address.
   - The default IP address is 192.168.1.2.
   - If you changed the IP address (Section 5.2 on page 52), use the new IP address.
   - If you changed the IP address and have forgotten it, see the troubleshooting suggestions for I forgot the IP address for the NWA570N.
2. Check the hardware connections, and make sure the LEDs are behaving as expected. See the Quick Start Guide.
3. Make sure your Internet browser does not block pop-up windows and has JavaScripts and Java enabled. See Appendix B on page 119.
4. Make sure your computer is in the same subnet as the NWA570N. (If you know that there are routers between your computer and the NWA570N, skip this step.)
   - If there is no DHCP server on your network, make sure your computer's IP address is in the same subnet as the NWA570N. See Appendix A on page 103.
5. Reset the device to its factory defaults, and try to access the NWA570N with the default IP address. See Section 1.8 on page 30.
6. If the problem continues, contact the network administrator or vendor.

I can see the **Login** screen, but I cannot log in to the NWA570N.

1. Make sure you have entered the user name and password correctly. The default password is **1234**. This field is case-sensitive, so make sure [Caps Lock] is not on.
2. You cannot log in to the web configurator while someone is using Telnet to access the NWA570N. Log out of the NWA570N in the other session, or ask the person who is logged in to log out.
3. Disconnect and re-connect the power adaptor or cord to the NWA570N.
4. If this does not work, you have to reset the device to its factory defaults. See Section 1.8 on page 30.

I cannot access the NWA570N from the WLAN.

1. Make sure the wireless adapter on the wireless station is working properly.
2. Check that both the NWA570N and your wireless station are using the same ESSID, channel and security settings.

I cannot ping any computer on the WLAN.

Make sure the wireless adapter on the wireless station(s) is working properly.

Check that both the NWA570N and wireless station(s) are using the same ESSID, channel and security settings.

I cannot Telnet to the NWA570N.

See the troubleshooting suggestions for I cannot see or access the Login screen in the web configurator. Ignore the suggestions about your browser.

I cannot use FTP to upload / download the configuration file. / I cannot use FTP to upload new firmware.

See the troubleshooting suggestions for I cannot see or access the Login screen in the web configurator. Ignore the suggestions about your browser.

8.3 Internet Access

I cannot access the Internet.

1. Check the hardware connections, and make sure the LEDs are behaving as expected. See the Quick Start Guide and Section 1.5 on page 28.
2. If you are trying to access the Internet wirelessly, make sure the wireless settings in the wireless client are the same as the settings in the AP.
3. Disconnect all the cables from your device, and follow the directions in the Quick Start Guide again.
4. If the problem continues, contact your ISP.

I cannot access the Internet anymore. I had access to the Internet (with the NWA570N), but my Internet connection is not available anymore.

1. Check the hardware connections, and make sure the LEDs are behaving as expected. See the Quick Start Guide and Section 1.5 on page 28.
2. Disconnect and re-connect the power adaptor to the NWA570N.
3. If the problem continues, contact your ISP.

The Internet connection is slow or intermittent.

1. There might be a lot of traffic on the network. Look at the LEDs, and check Section 1.5 on page 28. If the NWA570N is sending or receiving a lot of information, try closing some programs that use the Internet, especially peer-to-peer applications.
2. Check the signal strength. If the signal strength is low, try moving the NWA570N closer to the AP if possible, and look around to see if there are any devices that might be interfering with the wireless network (for example, microwaves, other wireless networks, and so on).
3. Disconnect and re-connect the power adaptor to the NWA570N.
4. If the problem continues, contact the network administrator or vendor.

9

Product Specifications and Wall-Mounting Instructions

The following tables summarize the NWA570N's hardware and firmware features.

Hardware Specifications

Table 29 Hardware Specifications

Dimensions	190 mm (Wide) × 128 mm (Deep) × 33 mm (High)
Weight	203 g
Ethernet Port	Four auto-negotiating, auto MDI/MDI-X 10/100 Mbps RJ-45 Ethernet ports
Cabling Type	4 x LAN UTP Category 5 or better
RESET button	The reset button is built into the rear panel. Use this button to restart the device or restore the factory default password.
WPS button	The WPS (WI-Fi Protected Setup) button is built into the rear panel. Use this button to set up a WPS connection with another WPS enabled device.
Antenna	3 external detachable 2 dBi dipole antenna with R-SMA connectors
LEDs	Status LEDs: • Power • Ethernet • WLAN • WPS
Power Requirements	12 V DC: 1 A Max
Operation Environment	Temperature: 0º C ~ 50º C Humidity: 20% ~ 95% RH
Storage Environment	Temperature: -20º ~ 70º C Humidity: 20% ~ 95% RH
Distance between the centers of the holes on the device's back.	74 mm

Table 29 Hardware Specifications (continued)

Recommended type of screws for wall-mounting	M3 Tap Screw
Certifications	Safety ANSI/UL-1950 3rd, CSA C22.2 No. 950 3rd, EN60950 (1992+A1+A2+A3+A4+A11), IEC 60950 3rd EMI FCC Part 15 Class B, EN55022 Class B, EN61000-3-2, EN61000-3-3 EMS EN61000-4-2/3/4/5/6/8/11

Firmware Specifications

Table 30 Firmware Features

FEATURE	DESCRIPTION
Default IP Address	192.168.1.2
Default Subnet Mask	255.255.255.0 (24 bits)
Default Password	1234
Device Management	Use the web configurator to easily configure the rich range of features on the NWA570N. FTP//Web for firmware downloading and configuration backup and restore. Limitation of client connections (# is configurable, default: unlimited) Intra BSS Block (enable/disable) Output Power Management (4-levels)
Wireless Functionality	Allows IEEE 802.11n draft 2.0 and either IEEE 802.11b or IEEE 802.11g wireless clients to connect to the NWA570N wirelessly. Enable wireless security (WEP, WPA(2), WPA(2)-PSK) and/or MAC filtering to protect your wireless network. Note: The NWA570N may be prone to RF (Radio Frequency) interference from other 2.4 GHz devices such as microwave ovens, wireless phones, Bluetooth enabled devices, and other wireless LANs.
Operating Modes	Access Point Client Bridge (up to four bridge links supported) Access Point and Repeater
Security	WPA and IEEE 802.1x security (EAP-TLS, EAP-TTLS, LEAP,. EAP-PEAP and Win XP PEAP included) 64/128/152-bits WEP WPA/WPA2 support based on 802.11i standard Dynamic WEP key exchange MAC address filtering through WLAN (supports up to 32 MAC address entries AES support

Table 30 Firmware Features

FEATURE	DESCRIPTION
Roaming	If you have two or more NWA570Ns (or other wireless access points) on your wireless network, you can enable this option so that wireless devices can change locations without having to log in again. This is useful for devices, such as notebooks, that move around a lot.
WDS Functionality	A Distribution System (DS) is a wired connection between two or more APs, while a Wireless Distribution System (WDS) is a wireless connection. Your NWA570N supports WDS connections to other NWA570N APs. This provides a cost-effective solution for wireless network expansion.
Wireless LAN MAC Address Filtering	Your NWA570N checks the MAC address of the wireless station against a list of allowed or denied MAC addresses.
Wireless Association List	With the wireless association list, you can see the list of the wireless stations that are currently using the NWA570N to access your wired network. When the NWA570N is in client mode, the wireless association list displays a list of wireless devices and networks in the area.
Output Power Management	Output Power Management is the ability to set the level of output power. There may be interference or difficulty with channel assignment when there is a high density of APs within a coverage area. In this case you can lower the output power of each access point, thus enabling you to place access points closer together.
Limit the Number of Client Connections	You may set a maximum number of wireless stations that may connect to the NWA570N. This may be necessary if for example, there is interference or difficulty with channel assignment due to a high density of APs within a coverage area.
Firmware Upgrade	Download new firmware (when available) from the ZyXEL web site and use the web configurator, an FTP or a TFTP tool to put it on the NWA570N. Note: Only upload firmware for your specific model!
Configuration Backup & Restoration	Make a copy of the NWA570N's configuration and put it back on the NWA570N later if you decide you want to revert back to an earlier configuration.

9.1 Standards Supported

The following list, which is not exhaustive, illustrates the standards supported in the NWA570N.

Table 31 Standards Supported

STANDARD	DESCRIPTION
RFC 867	Daytime Protocol
RFC 868	Time Protocol.
RFC 1112	IGMP v1
RFC 1305	Network Time Protocol (NTP version 3)
RFC 1631	IP Network Address Translator (NAT)
RFC 1661	The Point-to-Point Protocol (PPP)
RFC 2236	Internet Group Management Protocol, Version 2.
RFC 2516	A Method for Transmitting PPP Over Ethernet (PPPoE)

Table 31 Standards Supported (continued)

STANDARD	DESCRIPTION
RFC 2766	Network Address Translation - Protocol
IEEE 802.11	Also known by the brand Wi-Fi, denotes a set of Wireless LAN/WLAN standards developed by working group 11 of the IEEE LAN/MAN Standards Committee (IEEE 802).
IEEE 802.11b	Uses the 2.4 gigahertz (GHz) band
IEEE 802.11g	Uses the 2.4 gigahertz (GHz) band
IEEE 802.11d	Standard for Local and Metropolitan Area Networks: Media Access Control (MAC) Bridges
IEEE 802.11x	Port Based Network Access Control.
IEEE 802.11e QoS	IEEE 802.11 e Wireless LAN for Quality of Service
Microsoft PPTP	MS PPTP (Microsoft's implementation of Point to Point Tunneling Protocol)

Power Adaptor Specifications

Table 32 Power Adaptor Specifications

AUSTRALIAN PLUG STANDARDS	
AC Power Adapter Model	AD-121AE
Input Power	240 Volts AC 50Hz
Output Power	12 Volts DC ±5% 1 Amp
Power Consumption	12 Watts
Safety Standards	C-Tick
EUROPEAN PLUG STANDARDS	
AC Power Adapter Model	AD-121AB
Input Power	230 Volts AC 50Hz
Output Power	12 Volts DC ±5%, 1 Amp
Power Consumption	12 Watts
Safety Standards	CE mark, EN60950 (2001)
NORTH AMERICAN PLUG STANDARDS	
AC Power Adapter Model	AD-121A
Input Power	120 Volts AC 60Hz
Output Power	12 Volts DC ±5%, 1 Amp
Power Consumption	12 Watts
Safety Standards	UL
UK PLUG STANDARDS	
AC Power Adapter Model	AD-121AD
Input Power	240 Volts AC 50Hz
Output Power	12 Volts DC ±5% 1 Amp

Table 32 Power Adaptor Specifications (continued)

Power Consumption	12 Watts
Safety Standards	CE mark, EN60950 (2001)

Wall-mounting Instructions

Complete the following steps to hang your NWA570N on a wall.

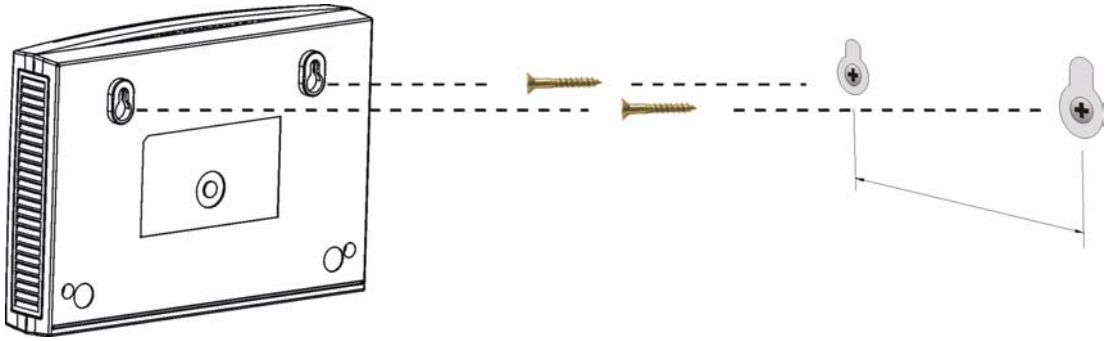
See Table 29 on page 95 for the size of screws to use and how far apart to place them.

1. Select a high position on a sturdy wall that is free of obstructions.
2. Drill two holes for the screws. The distance between the centers of the holes is listed in the product specifications appendix.

Be careful to avoid damaging pipes or cables located inside the wall when drilling holes for the screws.

3. Do not insert the screws all the way into the wall. Leave a small gap of about 0.5 cm between the heads of the screws and the wall.
4. Make sure the screws are snugly fastened to the wall. They need to hold the weight of the NWA570N with the connection cables.
5. Align the holes on the back of the NWA570N with the screws on the wall. Hang the NWA570N on the screws.

Figure 52 Wall-mounting Example



PART IV Appendices and Index

Setting up Your Computer's IP Address (103)
Pop-up Windows, JavaScripts and Java Permissions (119)
Wireless LANs (125)
Customer Support (139)
Legal Information (145)
Index (149)

A

Setting up Your Computer's IP Address

All computers must have a 10M or 100M Ethernet adapter card and TCP/IP installed.

Windows 95/98/Me/NT/2000/XP, Macintosh OS 7 and later operating systems and all versions of UNIX/LINUX include the software components you need to install and use TCP/IP on your computer. Windows 3.1 requires the purchase of a third-party TCP/IP application package.

TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

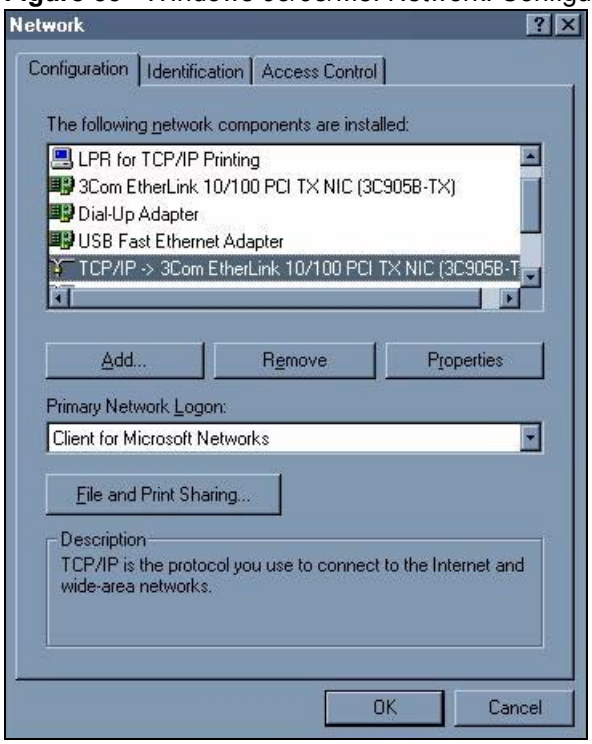
After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to "communicate" with your network.

If you manually assign IP information instead of using dynamic assignment, make sure that your computers have IP addresses that place them in the same subnet as the ZyXEL Device's LAN port.

Windows 95/98/Me

Click **Start**, **Settings**, **Control Panel** and double-click the **Network** icon to open the **Network** window.

Figure 53 WIndows 95/98/Me: Network: Configuration



Installing Components

The **Network** window **Configuration** tab displays a list of installed components. You need a network adapter, the TCP/IP protocol and Client for Microsoft Networks.

If you need the adapter:

1. In the **Network** window, click **Add**.
2. Select **Adapter** and then click **Add**.
3. Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

1. In the **Network** window, click **Add**.
2. Select **Protocol** and then click **Add**.
3. Select **Microsoft** from the list of **manufacturers**.
4. Select **TCP/IP** from the list of network protocols and then click **OK**.

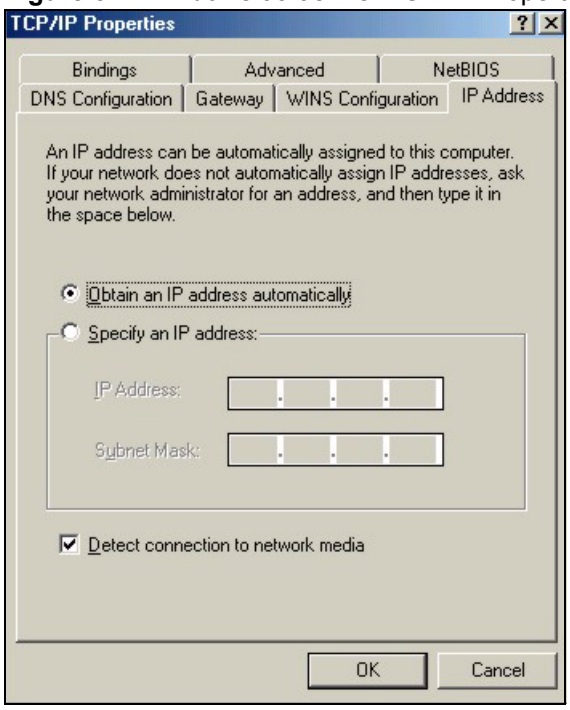
If you need Client for Microsoft Networks:

1. Click **Add**.
2. Select **Client** and then click **Add**.
3. Select **Microsoft** from the list of manufacturers.
4. Select **Client for Microsoft Networks** from the list of network clients and then click **OK**.
5. Restart your computer so the changes you made take effect.

Configuring

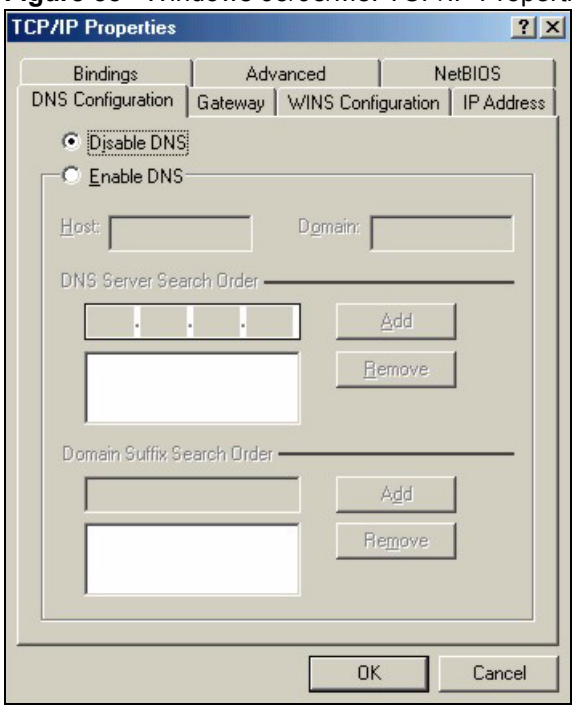
1. In the **Network** window **Configuration** tab, select your network adapter's TCP/IP entry and click **Properties**
2. Click the **IP Address** tab.
   - If your IP address is dynamic, select **Obtain an IP address automatically**.
   - If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.

Figure 54 Windows 95/98/Me: TCP/IP Properties: IP Address


TCP/IP Properties
Bindings
Advanced
NetBIOS
DNS Configuration
Gateway
WINS Configuration
IP Address
An IP address can be automatically assigned to this computer. If your network does not automatically assign IP addresses, ask your network administrator for an address, and then type it in the space below.
Obtain an IP address automatically
Specify an IP address:
IP Address:
Subnet Mask:
Detect connection to network media
OK
Cancel

3. Click the **DNS** Configuration tab.
   - If you do not know your DNS information, select **Disable DNS**.
   - If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).

Figure 55 Windows 95/98/Me: TCP/IP Properties: DNS Configuration



4 Click the **Gateway** tab.
   - If you do not know your gateway's IP address, remove previously installed gateways.
   - If you have a gateway IP address, type it in the **New gateway field** and click **Add**.
5 Click **OK** to save and close the **TCP/IP Properties** window.
6 Click **OK** to close the **Network** window. Insert the Windows CD if prompted.
7 Turn on your ZyXEL Device and restart your computer when prompted.

Verifying Settings

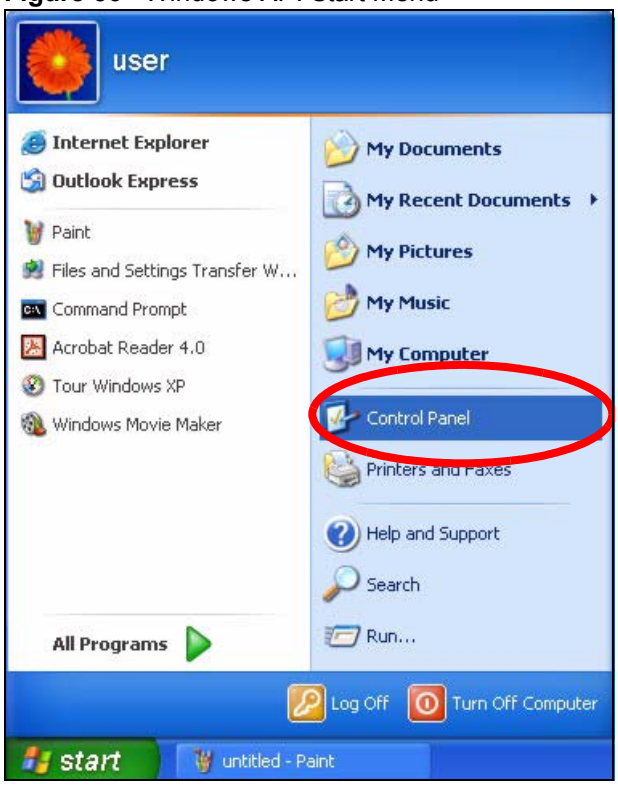
1 Click **Start** and then **Run**.
2 In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.
3 Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

The following example figures use the default Windows XP GUI theme.

1 Click **start** (**Start** in Windows 2000/NT), **Settings**, **Control Panel**.

Figure 56 Windows XP: Start Menu

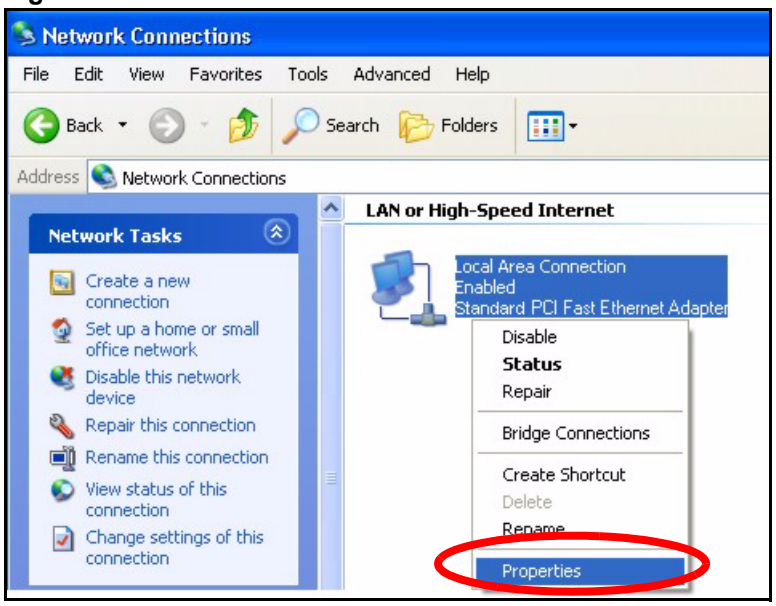


2 In the **Control Panel**, double-click **Network Connections** (**Network and Dial-up Connections** in Windows 2000/NT).

Figure 57 Windows XP: Control Panel

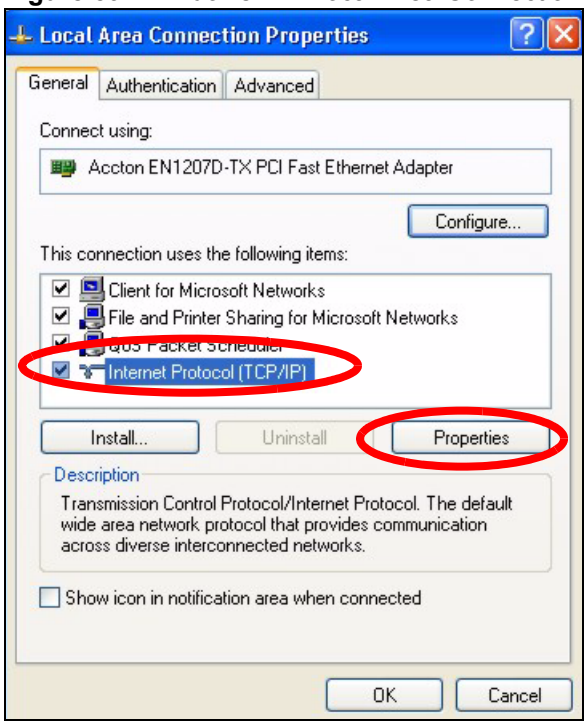
3 Right-click **Local Area Connection** and then click **Properties**.

Figure 58 Windows XP: Control Panel: Network Connections: Properties



4 Select **Internet Protocol (TCP/IP)** (under the **General** tab in Win XP) and then click **Properties**.

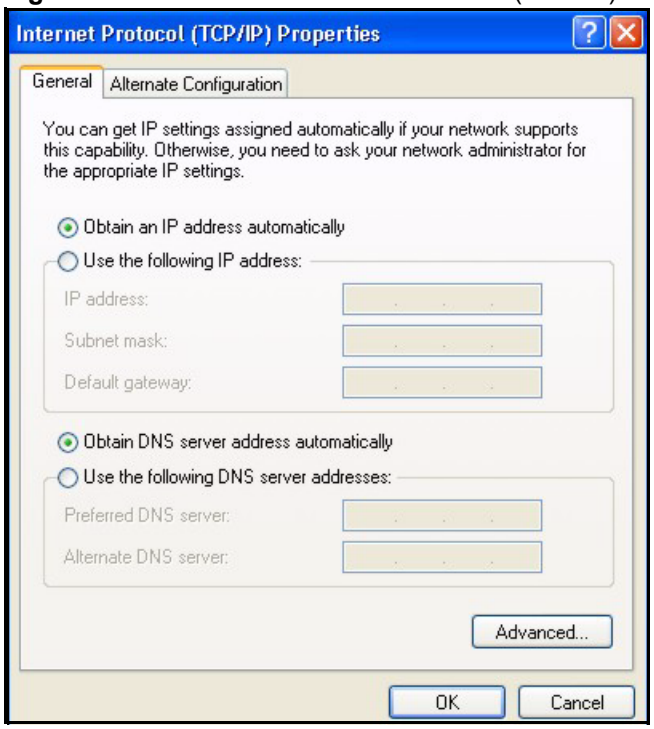
Figure 59 Windows XP: Local Area Connection Properties


Local Area Connection Properties
General Authentication Advanced
Connect using:
Accton EN1207D-TX PCI Fast Ethernet Adapter
Configure...
This connection uses the following items:
Client for Microsoft Networks
File and Printer Sharing for Microsoft Networks
Internet Protocol (TCP/IP)
Install... Uninstall Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
Show icon in notification area when connected
OK Cancel

5 The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

- If you have a dynamic IP address click **Obtain an IP address automatically**.
- If you have a static IP address click **Use the following IP Address** and fill in the **IP address**, **Subnet mask**, and **Default gateway** fields.
- Click **Advanced**.

Figure 60 Windows XP: Internet Protocol (TCP/IP) Properties

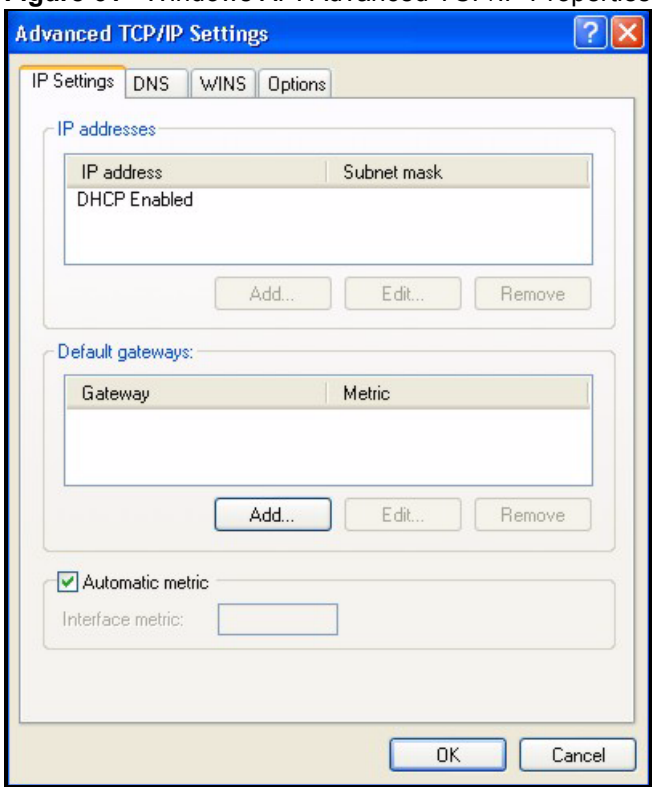

Internet Protocol (TCP/IP) Properties
General
Alternate Configuration
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

6 If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Settings** tab and click **OK**.

Do one or more of the following if you want to configure additional IP addresses:

- In the **IP Settings** tab, in IP addresses, click **Add**.
- In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.
- Repeat the above two steps for each IP address you want to add.
- Configure additional default gateways in the **IP Settings** tab by clicking **Add** in **Default gateways**.
- In **TCP/IP Gateway Address**, type the IP address of the default gateway in **Gateway**. To manually configure a default metric (the number of transmission hops), clear the **Automatic metric** check box and type a metric in **Metric**.
- Click **Add**.
- Repeat the previous three steps for each default gateway you want to add.
- Click **OK** when finished.

Figure 61 Windows XP: Advanced TCP/IP Properties

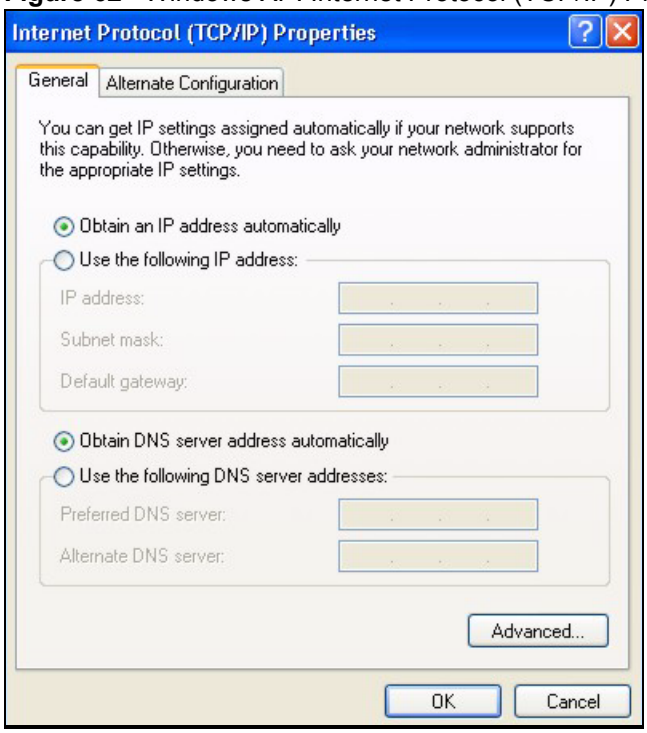


7 In the **Internet Protocol TCP/IP Properties** window (the **General** tab in Windows XP):

- Click **Obtain DNS server address automatically** if you do not know your DNS server IP address(es).
- If you know your DNS server IP address(es), click **Use the following DNS server addresses**, and type them in the **Preferred DNS server** and **Alternate DNS server** fields.

  If you have previously configured DNS servers, click **Advanced** and then the **DNS** tab to order them.

Figure 62 Windows XP: Internet Protocol (TCP/IP) Properties


Internet Protocol (TCP/IP) Properties
General
Alternate Configuration
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

8 Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.

9 Click **Close** (**OK** in Windows 2000/NT) to close the **Local Area Connection Properties** window.

10 Close the **Network Connections** window (**Network and Dial-up Connections** in Windows 2000/NT).

11 Turn on your ZyXEL Device and restart your computer (if prompted).

Verifying Settings

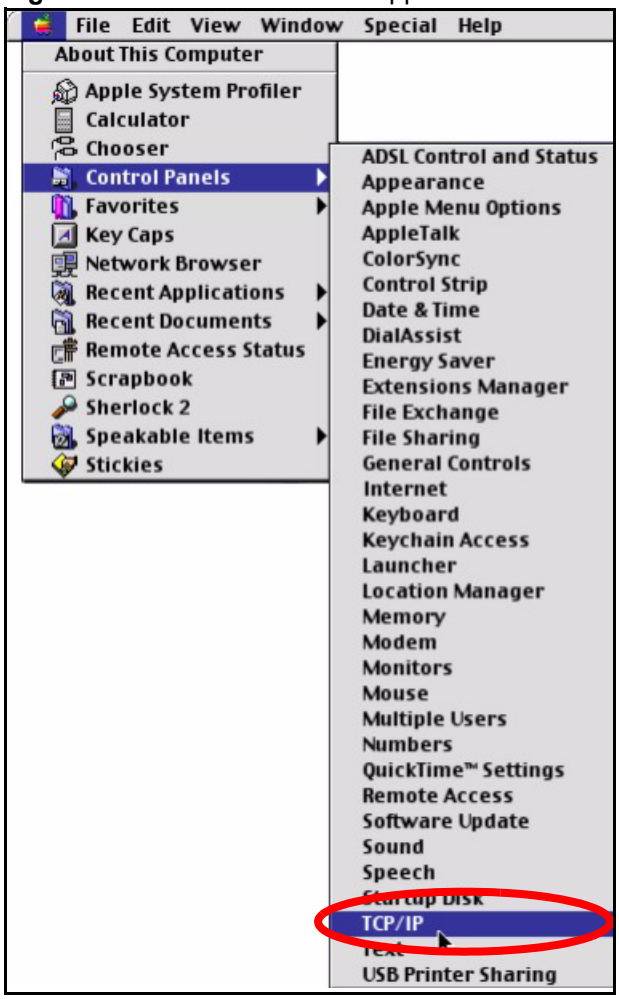
1 Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.

2 In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Macintosh OS 8/9

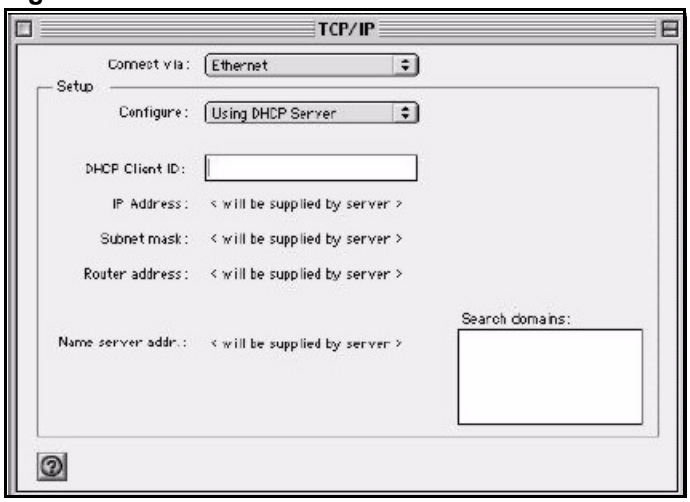
1 Click the **Apple** menu, **Control Panel** and double-click **TCP/IP** to open the **TCP/IP Control Panel**.

Figure 63 Macintosh OS 8/9: Apple Menu



2 Select **Ethernet built-in** from the **Connect via** list.

Figure 64 Macintosh OS 8/9: TCP/IP



3 For dynamically assigned settings, select **Using DHCP Server** from the **Configure:** list.

4 For statically assigned settings, do the following:

- From the **Configure** box, select **Manually**.

- Type your IP address in the **IP Address** box.
- Type your subnet mask in the **Subnet mask** box.
- Type the IP address of your ZyXEL Device in the **Router address** box.

5 Close the **TCP/IP Control Panel**.

6 Click **Save** if prompted, to save changes to your configuration.

7 Turn on your ZyXEL Device and restart your computer (if prompted).

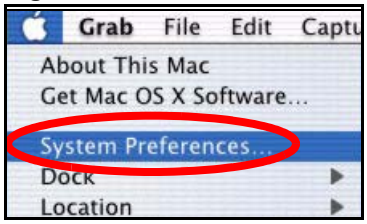
Verifying Settings

Check your TCP/IP properties in the **TCP/IP Control Panel** window.

Macintosh OS X

1 Click the **Apple** menu, and click **System Preferences** to open the **System Preferences** window.

Figure 65 Macintosh OS X: Apple Menu

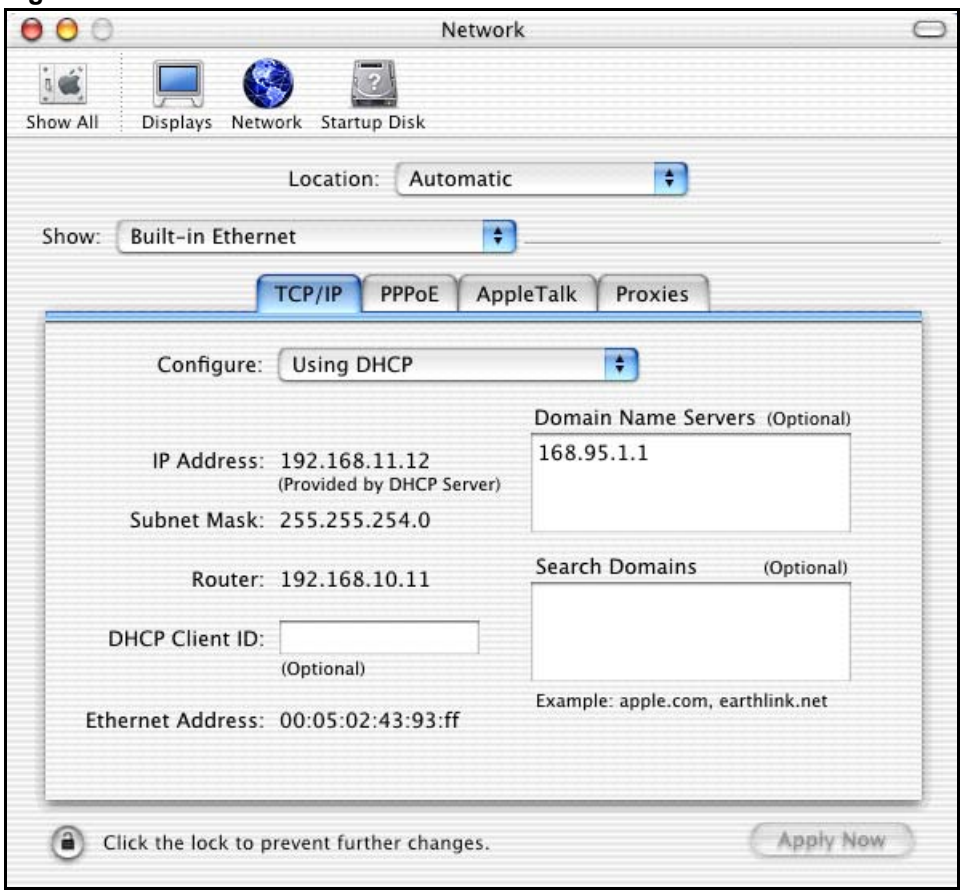


2 Click **Network** in the icon bar.

- Select **Automatic** from the **Location** list.
- Select **Built-in Ethernet** from the **Show** list.
- Click the **TCP/IP** tab.

3 For dynamically assigned settings, select **Using DHCP** from the **Configure** list.

Figure 66 Macintosh OS X: Network



4 For statically assigned settings, do the following:
   - From the **Configure** box, select **Manually**.
   - Type your IP address in the **IP Address** box.
   - Type your subnet mask in the **Subnet mask** box.
   - Type the IP address of your ZyXEL Device in the **Router address** box.
5 Click **Apply Now** and close the window.
6 Turn on your ZyXEL Device and restart your computer (if prompted).

Verifying Settings

Check your TCP/IP properties in the **Network** window.

Linux

This section shows you how to configure your computer's TCP/IP settings in Red Hat Linux 9.0. Procedure, screens and file location may vary depending on your Linux distribution and release version.

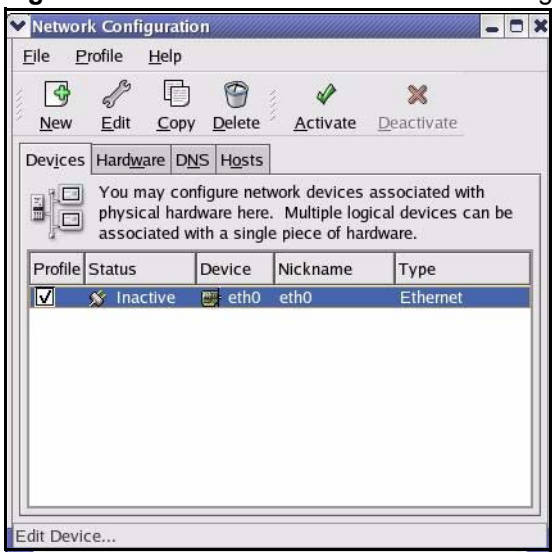
Make sure you are logged in as the root administrator.

Using the K Desktop Environment (KDE)

Follow the steps below to configure your computer IP address using the KDE.

1 Click the Red Hat button (located on the bottom left corner), select **System Setting** and click **Network**.

Figure 67 Red Hat 9.0: KDE: Network Configuration: Devices



2 Double-click on the profile of the network card you wish to configure. The **Ethernet Device General** screen displays as shown.

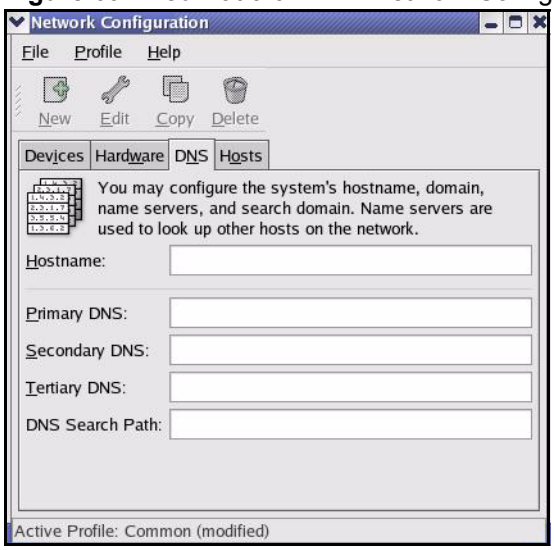
Figure 68 Red Hat 9.0: KDE: Ethernet Device: General

- If you have a dynamic IP address, click **Automatically obtain IP address settings with** and select **dhcp** from the drop down list.
- If you have a static IP address, click **Statically set IP Addresses** and fill in the **Address**, **Subnet mask**, and **Default Gateway Address** fields.

3 Click **OK** to save the changes and close the **Ethernet Device General** screen.

4 If you know your DNS server IP address(es), click the **DNS** tab in the **Network Configuration** screen. Enter the DNS server information in the fields provided.

Figure 69 Red Hat 9.0: KDE: Network Configuration: DNS



5 Click the **Devices** tab.

6 Click the **Activate** button to apply the changes. The following screen displays. Click **Yes to save the changes in all screens.**

Figure 70 Red Hat 9.0: KDE: Network Configuration: Activate

Question
redhat-config-network:
You have made some changes in your configuration.
To activate the network device eth0, the changes have to be saved.
Do you want to continue?
No
Yes

7 After the network card restart process is complete, make sure the **Status** is **Active** in the **Network Configuration** screen.

Using Configuration Files

Follow the steps below to edit the network configuration files and set your computer IP address.

1 Assuming that you have only one network card on the computer, locate the `ifconfig-eth0` configuration file (where `eth0` is the name of the Ethernet card). Open the configuration file with any plain text editor.

- If you have a dynamic IP address, enter **`dhcp`** in the `BOOTPROTO=` field. The following figure shows an example.

Figure 71 Red Hat 9.0: Dynamic IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=dhcp
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

- If you have a static IP address, enter **static** in the BOOTPROTO= field. Type IPADDR= followed by the IP address (in dotted decimal notation) and type NETMASK= followed by the subnet mask. The following example shows an example where the static IP address is 192.168.1.10 and the subnet mask is 255.255.255.0.

Figure 72 Red Hat 9.0: Static IP Address Setting in ifconfig-eth0

```
DEVICE=eth0
ONBOOT=yes
BOOTPROTO=static
IPADDR=192.168.1.10
NETMASK=255.255.255.0
USERCTL=no
PEERDNS=yes
TYPE=Ethernet
```

2. If you know your DNS server IP address(es), enter the DNS server information in the `resolv.conf` file in the `/etc` directory. The following figure shows an example where two DNS server IP addresses are specified.

Figure 73 Red Hat 9.0: DNS Settings in resolv.conf

```
nameserver 172.23.5.1
nameserver 172.23.5.2
```

3. After you edit and save the configuration files, you must restart the network card. Enter `./network restart` in the `/etc/rc.d/init.d` directory. The following figure shows an example.

Figure 74 Red Hat 9.0: Restart Ethernet Card

```
[root@localhost init.d]# network restart

Shutting down interface eth0:                [OK]
Shutting down loopback interface:            [OK]
Setting network parameters:                  [OK]
Bringing up loopback interface:              [OK]
Bringing up interface eth0:                  [OK]
```

Verifying Settings

Enter `ifconfig` in a terminal screen to check your TCP/IP properties.

Figure 75 Red Hat 9.0: Checking TCP/IP Properties

```
[root@localhost]# ifconfig
eth0      Link encap:Ethernet  HWaddr 00:50:BA:72:5B:44
          inet addr:172.23.19.129  Bcast:172.23.19.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:717 errors:0 dropped:0 overruns:0 frame:0
          TX packets:13 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:100
          RX bytes:730412 (713.2 Kb)  TX bytes:1570 (1.5 Kb)
          Interrupt:10 Base address:0x1000
[root@localhost]#
```

B

Pop-up Windows, JavaScripts and Java Permissions

In order to use the web configurator you need to allow:

- Web browser pop-up windows from your device.
- JavaScripts (enabled by default).
- Java permissions (enabled by default).

Internet Explorer 6 screens are used here. Screens for other Internet Explorer versions may vary.

Internet Explorer Pop-up Blockers

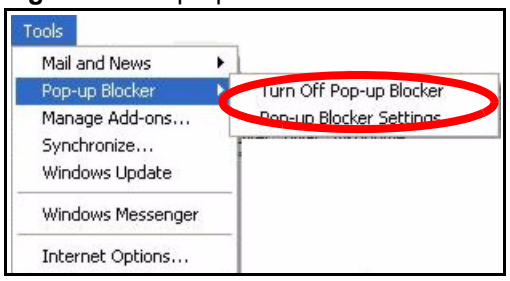
You may have to disable pop-up blocking to log into your device.

Either disable pop-up blocking (enabled by default in Windows XP SP (Service Pack) 2) or allow pop-up blocking and create an exception for your device's IP address.

Disable pop-up Blockers

1 In Internet Explorer, select **Tools**, **Pop-up Blocker** and then select **Turn Off Pop-up Blocker**.

Figure 76 Pop-up Blocker

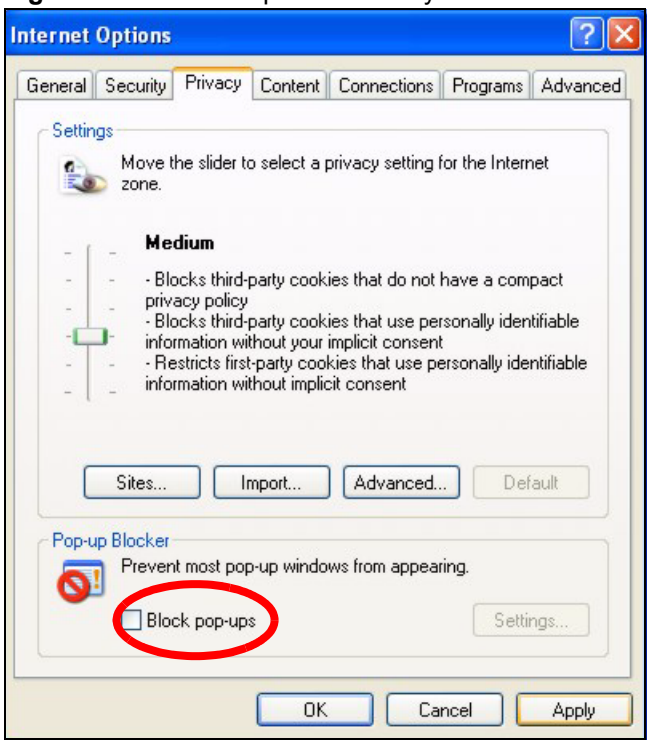


You can also check if pop-up blocking is disabled in the **Pop-up Blocker** section in the **Privacy** tab.

1 In Internet Explorer, select **Tools**, **Internet Options**, **Privacy**.

2 Clear the **Block pop-ups** check box in the **Pop-up Blocker** section of the screen. This disables any web pop-up blockers you may have enabled.

Figure 77 Internet Options: Privacy



3 Click **Apply** to save this setting.

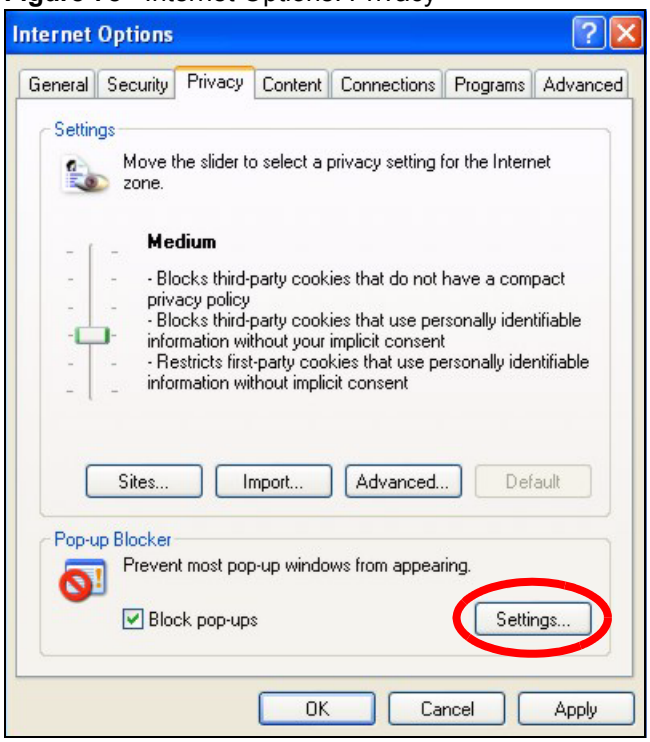
Enable pop-up Blockers with Exceptions

Alternatively, if you only want to allow pop-up windows from your device, see the following steps.

1 In Internet Explorer, select **Tools**, **Internet Options** and then the **Privacy** tab.

2 Select **Settings…**to open the **Pop-up Blocker Settings** screen.

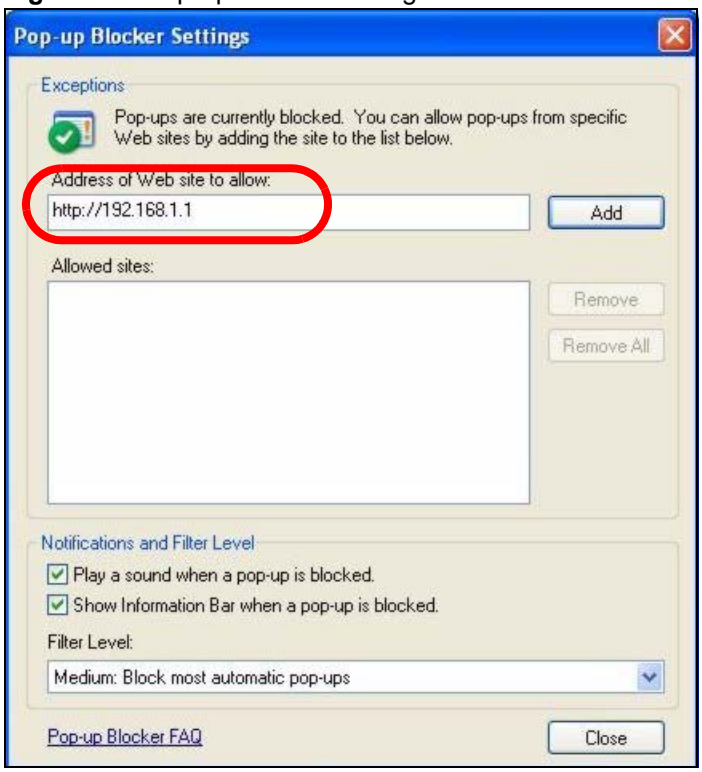
Figure 78 Internet Options: Privacy



3 Type the IP address of your device (the web page that you do not want to have blocked) with the prefix "http://". For example, http://192.168.167.1.

4 Click **Add** to move the IP address to the list of **Allowed sites**.

Figure 79 Pop-up Blocker Settings


Pop-up Blocker Settings
Exceptions
Pop-ups are currently blocked. You can allow pop-ups from specific Web sites by adding the site to the list below.
Address of Web site to allow:
http://192.168.1.1
Add
Allowed sites:
Remove
Remove All
Notifications and Filter Level
Play a sound when a pop-up is blocked.
Show Information Bar when a pop-up is blocked.
Filter Level:
Medium: Block most automatic pop-ups
Pop-up Blocker FAQ
Close

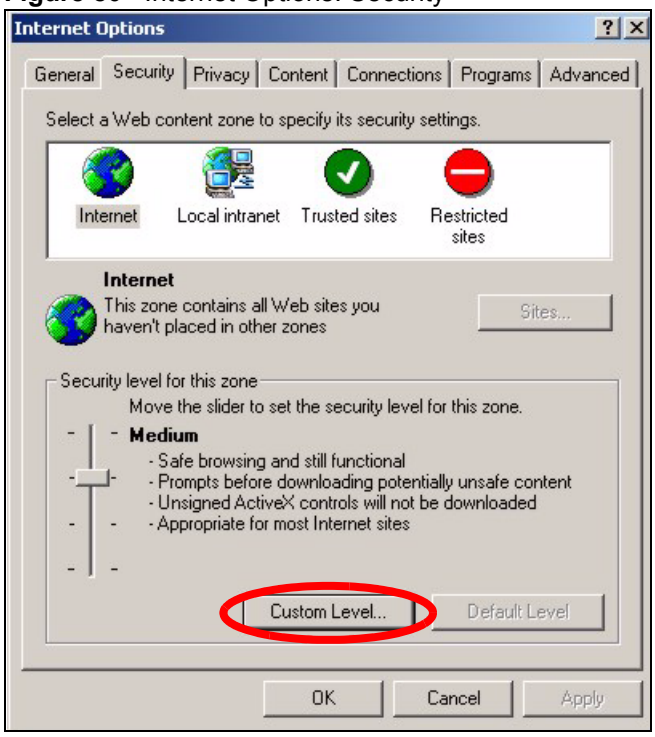
5 Click **Close** to return to the **Privacy** screen.
6 Click **Apply** to save this setting.

JavaScripts

If pages of the web configurator do not display properly in Internet Explorer, check that JavaScripts are allowed.

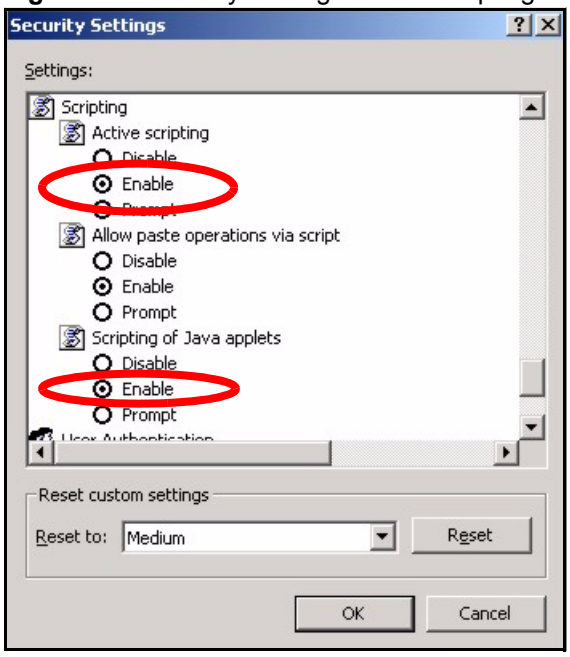
1 In Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.

Figure 80 Internet Options: Security



2 Click the **Custom Level...** button.
3 Scroll down to **Scripting**.
4 Under **Active scripting** make sure that **Enable** is selected (the default).
5 Under **Scripting of Java applets** make sure that **Enable** is selected (the default).
6 Click **OK** to close the window.

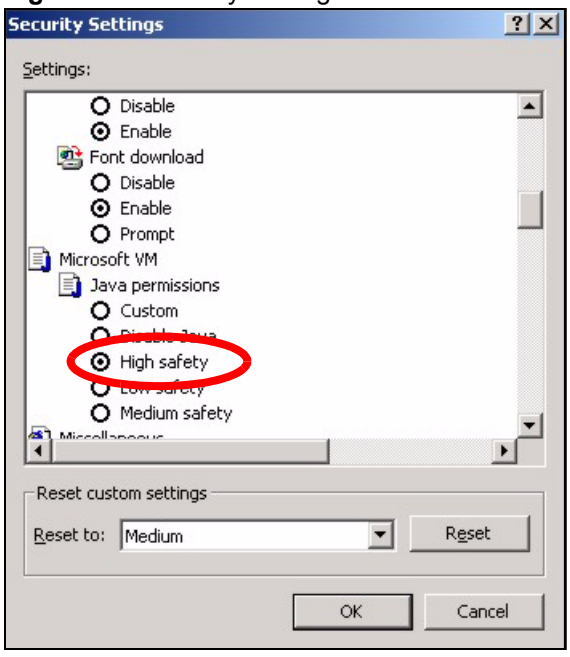
Figure 81 Security Settings - Java Scripting



Java Permissions

1. From Internet Explorer, click **Tools**, **Internet Options** and then the **Security** tab.
2. Click the **Custom Level...** button.
3. Scroll down to **Microsoft VM**.
4. Under **Java permissions** make sure that a safety level is selected.
5. Click **OK** to close the window.

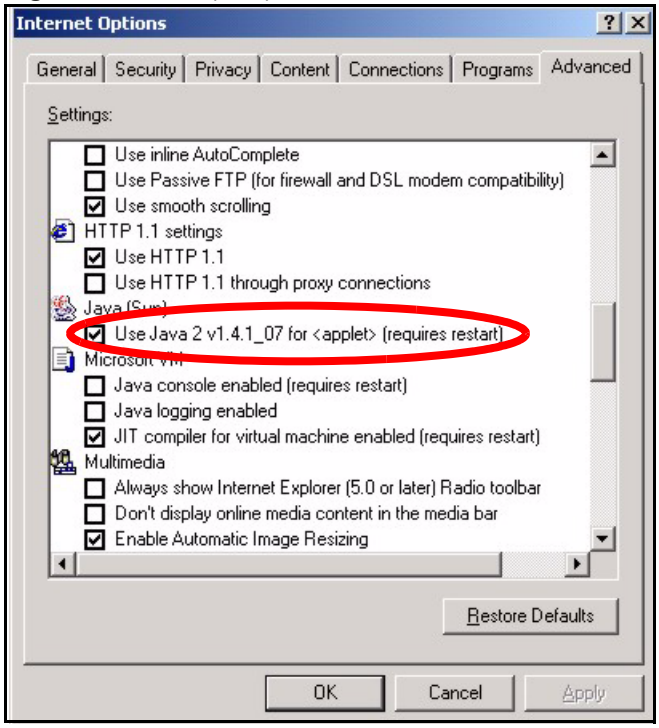
Figure 82 Security Settings - Java



JAVA (Sun)

1 From Internet Explorer, click **Tools**, **Internet Options** and then the **Advanced** tab.
2 Make sure that **Use Java 2 for <applet>** under **Java (Sun)** is selected.
3 Click **OK** to close the window.

Figure 83 Java (Sun)



C

Wireless LANs

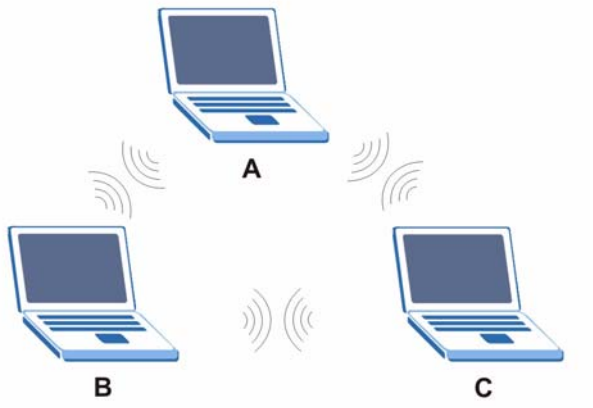
Wireless LAN Topologies

This section discusses ad-hoc and infrastructure wireless LAN topologies.

Ad-hoc Wireless LAN Configuration

The simplest WLAN configuration is an independent (Ad-hoc) WLAN that connects a set of computers with wireless adapters (A, B, C). Any time two or more wireless adapters are within range of each other, they can set up an independent network, which is commonly referred to as an ad-hoc network or Independent Basic Service Set (IBSS). The following diagram shows an example of notebook computers using wireless adapters to form an ad-hoc wireless LAN.

Figure 84 Peer-to-Peer Communication in an Ad-hoc Network

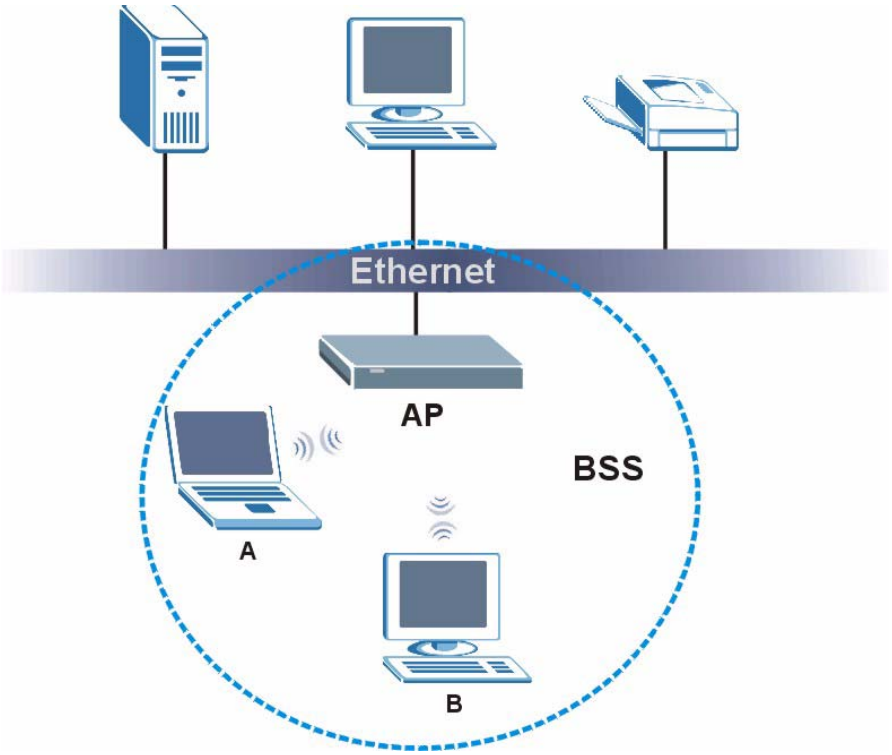


BSS

A Basic Service Set (BSS) exists when all communications between wireless clients or between a wireless client and a wired network client go through one access point (AP).

Intra-BSS traffic is traffic between wireless clients in the BSS. When Intra-BSS is enabled, wireless client **A** and **B** can access the wired network and communicate with each other. When Intra-BSS is disabled, wireless client **A** and **B** can still access the wired network but cannot communicate with each other.

Figure 85 Basic Service Set



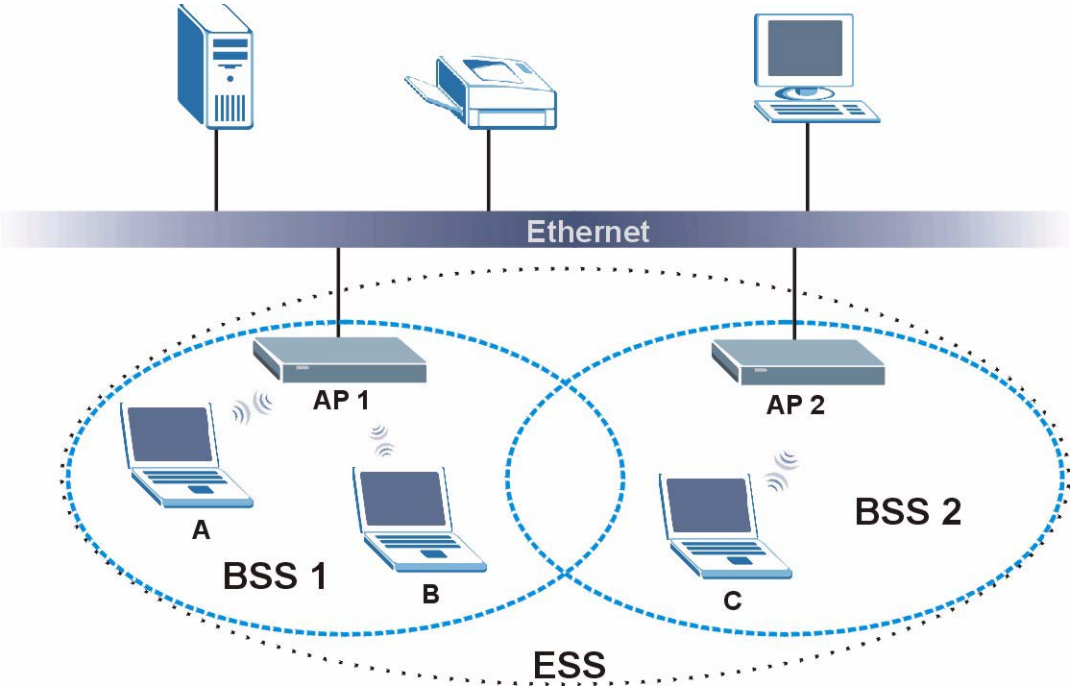
ESS

An Extended Service Set (ESS) consists of a series of overlapping BSSs, each containing an access point, with each access point connected together by a wired network. This wired connection between APs is called a Distribution System (DS).

This type of wireless LAN topology is called an Infrastructure WLAN. The Access Points not only provide communication with the wired network but also mediate wireless network traffic in the immediate neighborhood.

An ESSID (ESS IDentification) uniquely identifies each ESS. All access points and their associated wireless clients within the same ESS must have the same ESSID in order to communicate.

Figure 86 Infrastructure WLAN



Channel

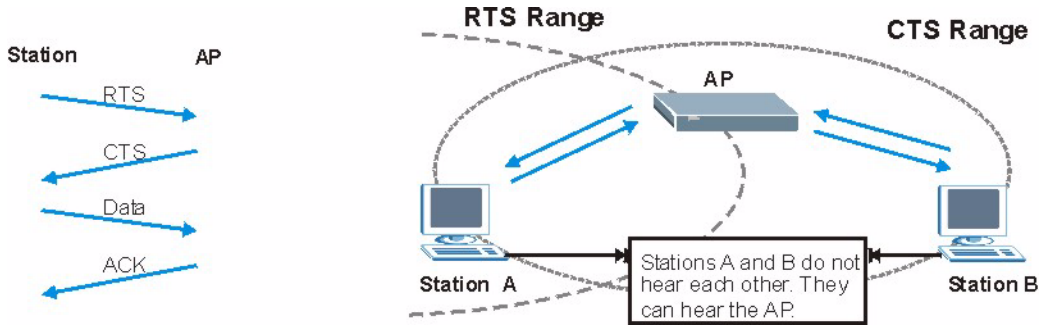
A channel is the radio frequency(ies) used by IEEE 802.11a/b/g wireless devices. Channels available depend on your geographical area. You may have a choice of channels (for your region) so you should use a different channel than an adjacent AP (access point) to reduce interference. Interference occurs when radio signals from different access points overlap causing interference and degrading performance.

Adjacent channels partially overlap however. To avoid interference due to overlap, your AP should be on a channel at least five channels away from a channel that an adjacent AP is using. For example, if your region has 11 channels and an adjacent AP is using channel 1, then you need to select a channel between 6 or 11.

RTS/CTS

A hidden node occurs when two stations are within range of the same access point, but are not within range of each other. The following figure illustrates a hidden node. Both stations (STA) are within range of the access point (AP) or wireless gateway, but out-of-range of each other, so they cannot "hear" each other, that is they do not know if the channel is currently being used. Therefore, they are considered hidden from each other.

Figure 87 RTS/CTS



When station **A** sends data to the AP, it might not know that the station **B** is already using the channel. If these two stations send data at the same time, collisions may occur when both sets of data arrive at the AP at the same time, resulting in a loss of messages for both stations.

RTS/CTS is designed to prevent collisions due to hidden nodes. An **RTS/CTS** defines the biggest size data frame you can send before an RTS (Request To Send)/CTS (Clear to Send) handshake is invoked.

When a data frame exceeds the **RTS/CTS** value you set (between 0 to 2432 bytes), the station that wants to transmit this frame must first send an RTS (Request To Send) message to the AP for permission to send it. The AP then responds with a CTS (Clear to Send) message to all other stations within its range to notify them to defer their transmission. It also reserves and confirms with the requesting station the time frame for the requested transmission.

Stations can send frames smaller than the specified **RTS/CTS** directly to the AP without the RTS (Request To Send)/CTS (Clear to Send) handshake.

You should only configure **RTS/CTS** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake.

If the **RTS/CTS** value is greater than the **Fragmentation Threshold** value (see next), then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Enabling the RTS Threshold causes redundant network overhead that could negatively affect the throughput performance instead of providing a remedy.

Fragmentation Threshold

A **Fragmentation Threshold** is the maximum data fragment size (between 256 and 2432 bytes) that can be sent in the wireless network before the AP will fragment the packet into smaller data frames.

A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference.

If the **Fragmentation Threshold** value is smaller than the **RTS/CTS** value (see previously) you set then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS** size.

Preamble Type

Preamble is used to signal that data is coming to the receiver. **Short** and **Long** refer to the length of the synchronization field in a packet.

Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b/g compliant wireless adapters support long preamble, but not all support short preamble.

Select **Long** preamble if you are unsure what preamble mode the wireless adapters support, and to provide more reliable communications in busy wireless networks.

Select **Short** preamble if you are sure the wireless adapters support it, and to provide more efficient communications.

Select **Dynamic** to have the AP automatically use short preamble when wireless adapters support it, otherwise the AP uses long preamble.

The AP and the wireless adapters MUST use the same preamble mode in order to communicate.

IEEE 802.11g Wireless LAN

IEEE 802.11g is fully compatible with the IEEE 802.11b standard. This means an IEEE 802.11b adapter can interface directly with an IEEE 802.11g access point (and vice versa) at 11 Mbps or lower depending on range. IEEE 802.11g has several intermediate rate steps between the maximum and minimum data rates. The IEEE 802.11g data rate and modulation are as follows:

Table 33 IEEE 802.11g

DATA RATE (MBPS)	MODULATION
1	DBPSK (Differential Binary Phase Shift Keyed)
2	DQPSK (Differential Quadrature Phase Shift Keying)
5.5 / 11	CCK (Complementary Code Keying)
6/9/12/18/24/36/48/54	OFDM (Orthogonal Frequency Division Multiplexing)

Wireless Security Overview

Wireless security is vital to your network to protect wireless communication between wireless clients, access points and the wired network.

Wireless security methods available on the ZyXEL Device are data encryption, wireless client authentication, restricting access by device MAC address and hiding the ZyXEL Device identity.

The following figure shows the relative effectiveness of these wireless security methods available on your ZyXEL Device.

Table 34 Wireless Security Levels

SECURITY LEVEL	SECURITY TYPE
Least Secure	Unique SSID (Default)
	Unique SSID with Hide SSID Enabled
	MAC Address Filtering
	WEP Encryption
	IEEE802.1x EAP with RADIUS Server Authentication
	Wi-Fi Protected Access (WPA)
Most Secure	WPA2

You must enable the same wireless security settings on the ZyXEL Device and on all wireless clients that you want to associate with it.

IEEE 802.1x

In June 2001, the IEEE 802.1x standard was designed to extend the features of IEEE 802.11 to support extended authentication as well as providing additional accounting and control features. It is supported by Windows XP and a number of network devices. Some advantages of IEEE 802.1x are:

- User based identification that allows for roaming.
- Support for RADIUS (Remote Authentication Dial In User Service, RFC 2138, 2139) for centralized user profile and accounting management on a network RADIUS server.
- Support for EAP (Extensible Authentication Protocol, RFC 2486) that allows additional authentication methods to be deployed with no changes to the access point or the wireless clients.

RADIUS

RADIUS is based on a client-server model that supports authentication, authorization and accounting. The access point is the client and the server is the RADIUS server. The RADIUS server handles the following tasks:

- Authentication
  Determines the identity of the users.
- Authorization

Determines the network services available to authenticated users once they are connected to the network.

- Accounting
  Keeps track of the client's network activity.

RADIUS is a simple package exchange in which your AP acts as a message relay between the wireless client and the network RADIUS server.

Types of RADIUS Messages

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user authentication:

- Access-Request
  Sent by an access point requesting authentication.
- Access-Reject
  Sent by a RADIUS server rejecting access.
- Access-Accept
  Sent by a RADIUS server allowing access.
- Access-Challenge
  Sent by a RADIUS server requesting more information in order to allow access. The access point sends a proper response from the user and then sends another Access-Request message.

The following types of RADIUS messages are exchanged between the access point and the RADIUS server for user accounting:

- Accounting-Request
  Sent by the access point requesting accounting.
- Accounting-Response
  Sent by the RADIUS server to indicate that it has started or stopped accounting.

In order to ensure network security, the access point and the RADIUS server use a shared secret key, which is a password, they both know. The key is not sent over the network. In addition to the shared key, password information exchanged is also encrypted to protect the network from unauthorized access.

Types of EAP Authentication

This section discusses some popular authentication types: EAP-MD5, EAP-TLS, EAP-TTLS, PEAP and LEAP. Your wireless LAN device may not support all authentication types.

EAP (Extensible Authentication Protocol) is an authentication protocol that runs on top of the IEEE 802.1x transport mechanism in order to support multiple types of user authentication. By using EAP to interact with an EAP-compatible RADIUS server, an access point helps a wireless station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server and an intermediary AP(s) that supports IEEE 802.1x. .

For EAP-TLS authentication type, you must first have a wired connection to the network and obtain the certificate(s) from a certificate authority (CA). A certificate (also called digital IDs) can be used to authenticate users and a CA issues certificates and guarantees the identity of each certificate owner.

EAP-MD5 (Message-Digest Algorithm 5)

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the wireless client. The wireless client 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plaintext passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

EAP-TLS (Transport Layer Security)

With EAP-TLS, digital certifications are needed by both the server and the wireless clients for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAP-TLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

EAP-TTLS (Tunneled Transport Layer Service)

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending username and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

PEAP (Protected EAP)

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple username and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2 and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE 802.1x.

Dynamic WEP Key Exchange

The AP maps a unique key that is generated with the RADIUS server. This key expires when the wireless connection times out, disconnects or reauthentication times out. A new WEP key is generated each time reauthentication is performed.

If this feature is enabled, it is not necessary to configure a default encryption key in the Wireless screen. You may still configure and store keys here, but they will not be used while Dynamic WEP is enabled.

EAP-MD5 cannot be used with Dynamic WEP Key Exchange

For added security, certificate-based authentications (EAP-TLS, EAP-TTLS and PEAP) use dynamic keys for data encryption. They are often deployed in corporate environments, but for public deployment, a simple user name and password pair is more practical. The following table is a comparison of the features of authentication types.

Table 35 Comparison of EAP Authentication Types

	EAP-MD5	EAP-TLS	EAP-TTLS	PEAP	LEAP
Mutual Authentication	No	Yes	Yes	Yes	Yes
Certificate – Client	No	Yes	Optional	Optional	No
Certificate – Server	No	Yes	Yes	Yes	No
Dynamic Key Exchange	No	Yes	Yes	Yes	Yes
Credential Integrity	None	Strong	Strong	Strong	Moderate
Deployment Difficulty	Easy	Hard	Moderate	Moderate	Moderate
Client Identity Protection	No	No	Yes	Yes	No

WPA and WPA2

Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i standard. WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA.

Key differences between WPA or WPA2 and WEP are improved data encryption and user authentication.

If both an AP and the wireless clients support WPA2 and you have an external RADIUS server, use WPA2 for stronger data encryption. If you don't have an external RADIUS server, you should use WPA2-PSK (WPA2-Pre-Shared Key) that only requires a single (identical) password entered into each access point, wireless gateway and wireless client. As long as the passwords match, a wireless client will be granted access to a WLAN.

If the AP or the wireless clients do not support WPA2, just use WPA or WPA-PSK depending on whether you have an external RADIUS server or not.

Select WEP only when the AP and/or wireless clients do not support WPA or WPA2. WEP is less secure than WPA or WPA2.

Encryption

Both WPA and WPA2 improve data encryption by using Temporal Key Integrity Protocol (TKIP), Message Integrity Check (MIC) and IEEE 802.1x. WPA and WPA2 use Advanced Encryption Standard (AES) in the Counter mode with Cipher block chaining Message authentication code Protocol (CCMP) to offer stronger encryption than TKIP.

TKIP uses 128-bit keys that are dynamically generated and distributed by the authentication server. AES (Advanced Encryption Standard) is a block cipher that uses a 256-bit mathematical algorithm called Rijndael. They both include a per-packet key mixing function, a Message Integrity Check (MIC) named Michael, an extended initialization vector (IV) with sequencing rules, and a re-keying mechanism.

WPA and WPA2 regularly change and rotate the encryption keys so that the same encryption key is never used twice.

The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the PMK to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the wireless clients. This all happens in the background automatically.

The Message Integrity Check (MIC) is designed to prevent an attacker from capturing data packets, altering them and resending them. The MIC provides a strong mathematical function in which the receiver and the transmitter each compute and then compare the MIC. If they do not match, it is assumed that the data has been tampered with and the packet is dropped.

By generating unique data encryption keys for every data packet and by creating an integrity checking mechanism (MIC), with TKIP and AES it is more difficult to decrypt data on a Wi-Fi network than WEP and difficult for an intruder to break into the network.

The encryption mechanisms used for WPA(2) and WPA(2)-PSK are the same. The only difference between the two is that WPA(2)-PSK uses a simple common password, instead of user-specific credentials. The common-password approach makes WPA(2)-PSK susceptible to brute-force password-guessing attacks but it's still an improvement over WEP as it employs a consistent, single, alphanumeric password to derive a PMK which is used to generate unique temporal encryption keys. This prevent all wireless devices sharing the same encryption keys. (a weakness of WEP)

User Authentication

WPA and WPA2 apply IEEE 802.1x and Extensible Authentication Protocol (EAP) to authenticate wireless clients using an external RADIUS database. WPA2 reduces the number of key exchange messages from six to four (CCMP 4-way handshake) and shortens the time required to connect to a network. Other WPA2 authentication features that are different from WPA include key caching and pre-authentication. These two features are optional and may not be supported in all wireless devices.

Key caching allows a wireless client to store the PMK it derived through a successful authentication with an AP. The wireless client uses the PMK when it tries to connect to the same AP and does not need to go with the authentication process again.

Pre-authentication enables fast roaming by allowing the wireless client (already connecting to an AP) to perform IEEE 802.1x authentication with another AP before connecting to it.

Wireless Client WPA Supplicants

A wireless client supplicant is the software that runs on an operating system instructing the wireless client how to use WPA. At the time of writing, the most widely available supplicant is the WPA patch for Windows XP, Funk Software's Odyssey client.

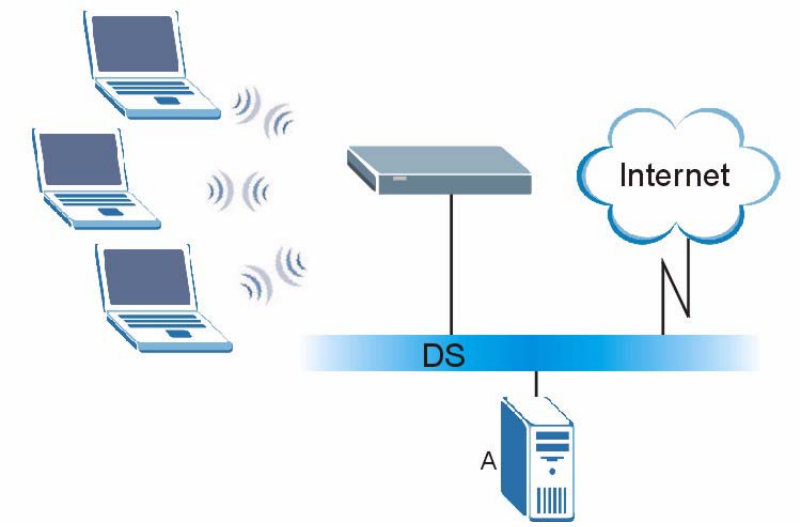
The Windows XP patch is a free download that adds WPA capability to Windows XP's built-in "Zero Configuration" wireless client. However, you must run Windows XP to use it.

WPA(2) with RADIUS Application Example

You need the IP address of the RADIUS server, its port number (default is 1812), and the RADIUS shared secret. A WPA(2) application example with an external RADIUS server looks as follows. "A" is the RADIUS server. "DS" is the distribution system.

1. The AP passes the wireless client's authentication request to the RADIUS server.
2. The RADIUS server then checks the user's identification against its database and grants or denies network access accordingly.
3. The RADIUS server distributes a Pairwise Master Key (PMK) key to the AP that then sets up a key hierarchy and management system, using the pair-wise key to dynamically generate unique data encryption keys to encrypt every data packet that is wirelessly communicated between the AP and the wireless clients.

Figure 88 WPA(2) with RADIUS Application Example



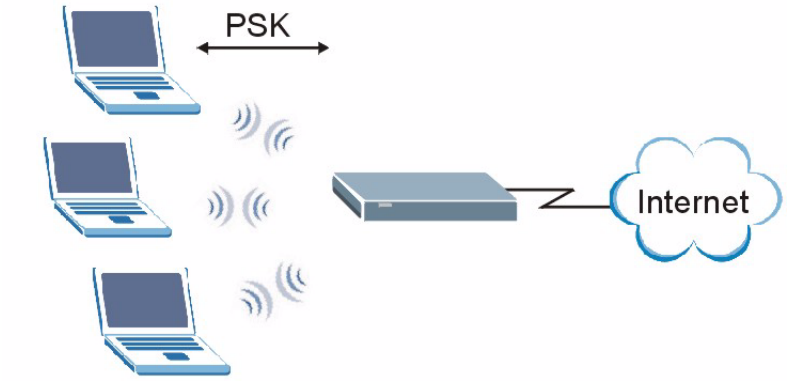
WPA(2)-PSK Application Example

A WPA(2)-PSK application looks as follows.

1. First enter identical passwords into the AP and all wireless clients. The Pre-Shared Key (PSK) must consist of between 8 and 63 ASCII characters or 64 hexadecimal characters (including spaces and symbols).
2. The AP checks each wireless client's password and (only) allows it to join the network if the password matches.
3. The AP and wireless clients use the pre-shared key to generate a common PMK (Pairwise Master Key).

4 The AP and wireless clients use the TKIP or AES encryption process to encrypt data exchanged between them.

Figure 89 WPA(2)-PSK Authentication



Security Parameters Summary

Refer to this table to see what other security parameters you should configure for each Authentication Method/ key management protocol type. MAC address filters are not dependent on how you configure these security features.

Table 36 Wireless Security Relational Matrix

AUTHENTICATION METHOD/ KEY MANAGEMENT PROTOCOL	ENCRYPTION METHOD	ENTER MANUAL KEY	IEEE 802.1X
Open	None	No	Disable
			Enable without Dynamic WEP Key
Open	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
Shared	WEP	No	Enable with Dynamic WEP Key
		Yes	Enable without Dynamic WEP Key
		Yes	Disable
WPA	TKIP/AES	No	Enable
WPA-PSK	TKIP/AES	Yes	Disable
WPA2	TKIP/AES	No	Enable
WPA2-PSK	TKIP/AES	Yes	Disable

Antenna Overview

An antenna couples RF signals onto air. A transmitter within a wireless device sends an RF signal to the antenna, which propagates the signal through the air. The antenna also operates in reverse by capturing RF signals from the air.

Positioning the antennas properly increases the range and coverage area of a wireless LAN.

Antenna Characteristics

Frequency

An antenna in the frequency of 2.4GHz (IEEE 802.11b) or 5GHz(IEEE 802.11a) is needed to communicate efficiently in a wireless LAN.

Radiation Pattern

A radiation pattern is a diagram that allows you to visualize the shape of the antenna's coverage area.

Antenna Gain

Antenna gain, measured in dB (decibel), is the increase in coverage within the RF beam width. Higher antenna gain improves the range of the signal for better communications.

For an indoor site, each 1 dB increase in antenna gain results in a range increase of approximately 2.5%. For an unobstructed outdoor site, each 1dB increase in gain results in a range increase of approximately 5%. Actual results may vary depending on the network environment.

Antenna gain is sometimes specified in dBi, which is how much the antenna increases the signal power compared to using an isotropic antenna. An isotropic antenna is a theoretical perfect antenna that sends out radio signals equally well in all directions. dBi represents the true gain that the antenna provides.

Types of Antennas for WLAN

There are two types of antennas used for wireless LAN applications.

- Omni-directional antennas send the RF signal out in all directions on a horizontal plane. The coverage area is torus-shaped (like a donut) which makes these antennas ideal for a room environment. With a wide coverage area, it is possible to make circular overlapping coverage areas with multiple access points.
- Directional antennas concentrate the RF signal in a beam, like a flashlight does with the light from its bulb. The angle of the beam determines the width of the coverage pattern. Angles typically range from 20 degrees (very directional) to 120 degrees (less directional). Directional antennas are ideal for hallways and outdoor point-to-point applications.

Positioning Antennas

In general, antennas should be mounted as high as practically possible and free of obstructions. In point-to–point application, position both antennas at the same height and in a direct line of sight to each other to attain the best performance.

For omni-directional antennas mounted on a table, desk, and so on, point the antenna up. For omni-directional antennas mounted on a wall or ceiling, point the antenna down. For a single AP application, place omni-directional antennas as close to the center of the coverage area as possible.

For directional antennas, point the antenna in the direction of the desired coverage area.

Customer Support

Please have the following information ready when you contact customer support.

Required Information

- Product model and serial number.
- Warranty Information.
- Date that you received your device.
- Brief description of the problem and the steps you took to solve it.

"+" is the (prefix) number you dial to make an international telephone call.

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E

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The device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operations.

This device has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This device generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this device does cause harmful interference to radio/television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and the receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement

- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- IEEE 802.11b or 802.11g operation of this product in the U.S.A. is firmware-limited to channels 1 through 11.
- To comply with FCC RF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

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第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device has been designed for the WLAN 2.4 GHz network throughout the EC region and Switzerland, with restrictions in France.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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